ENGINEERING FINANCE COMMERCE

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MAR 7 1934

THE FAR EASTERN REVIEW



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遠東時報

TWO YOUNG MEN IN CHINA

RESPONSIBILITY FOR PEACE AND WAR IN THE PACIFIC

THE SITUATION IN MANCHOUKUO

Vol. XXX JANUARY, 1934 No. 1

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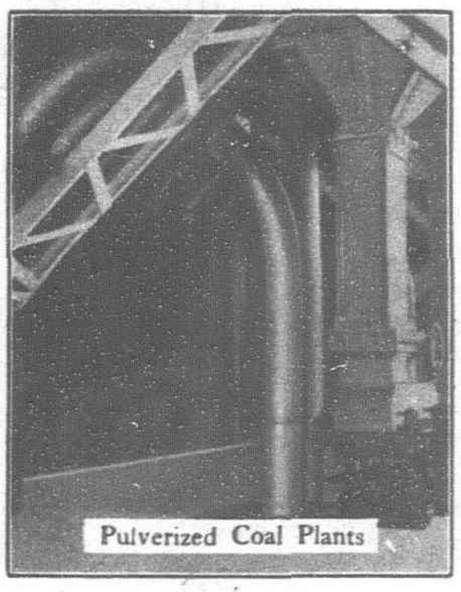
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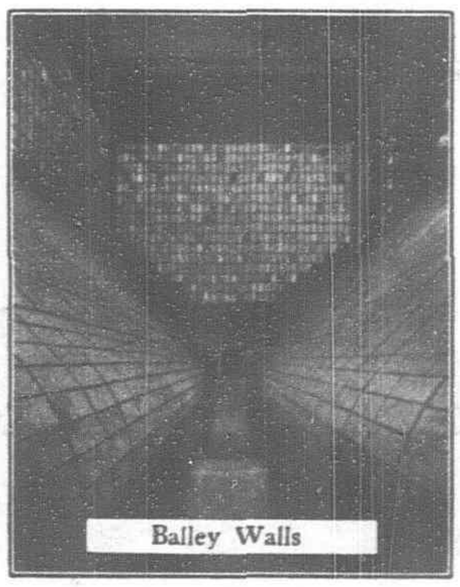
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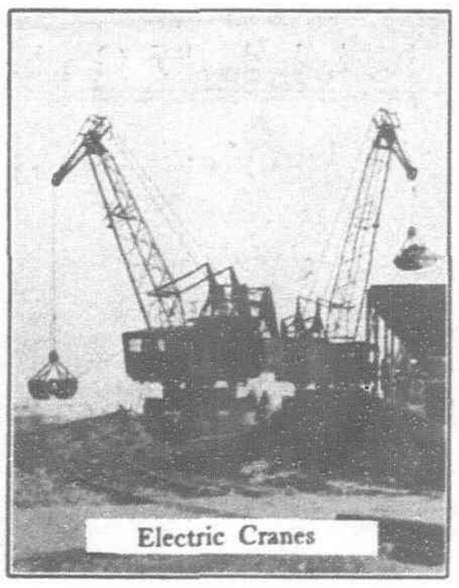
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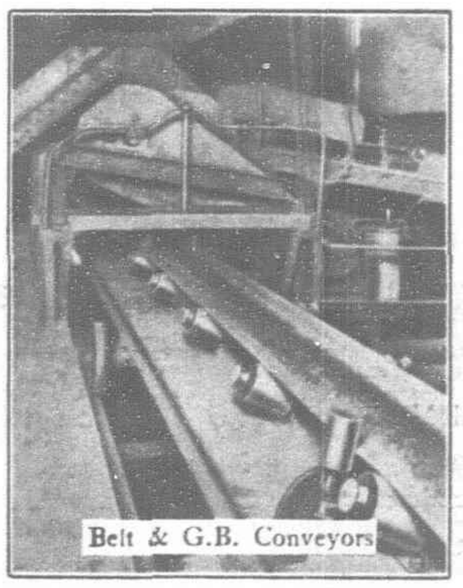
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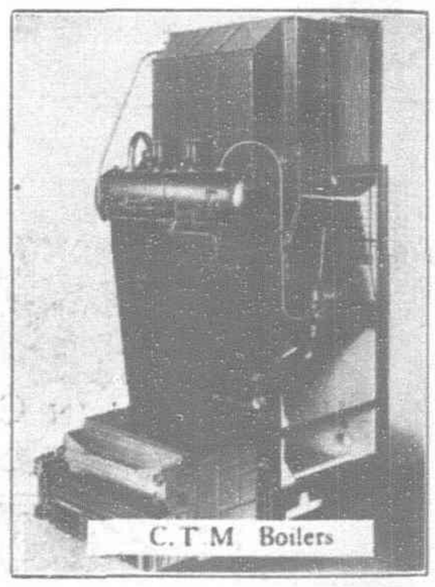
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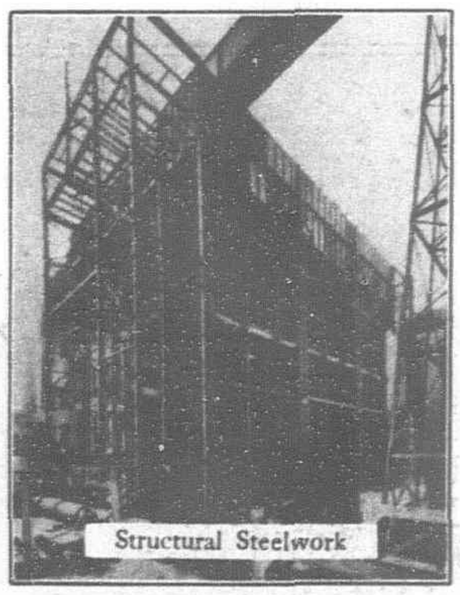

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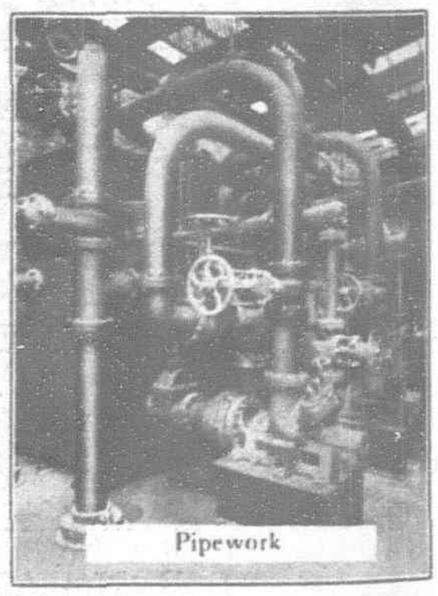
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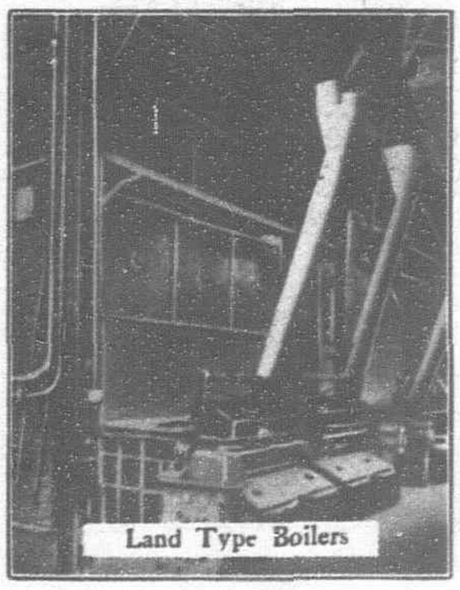
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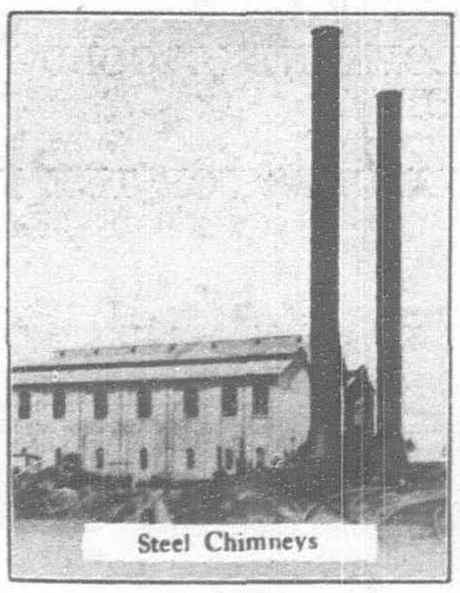
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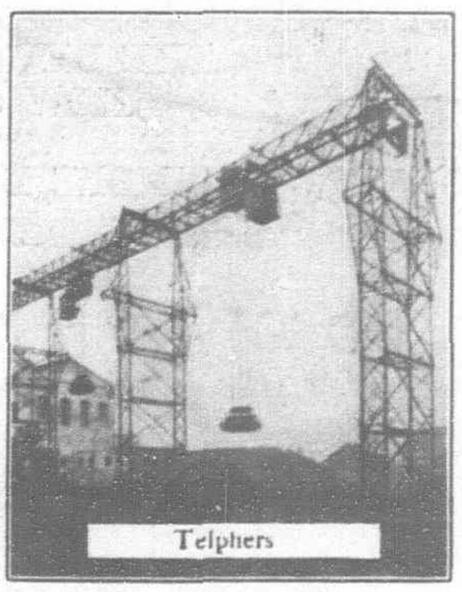
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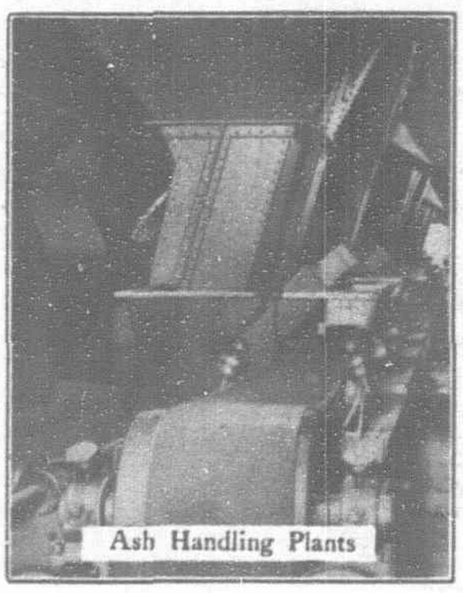
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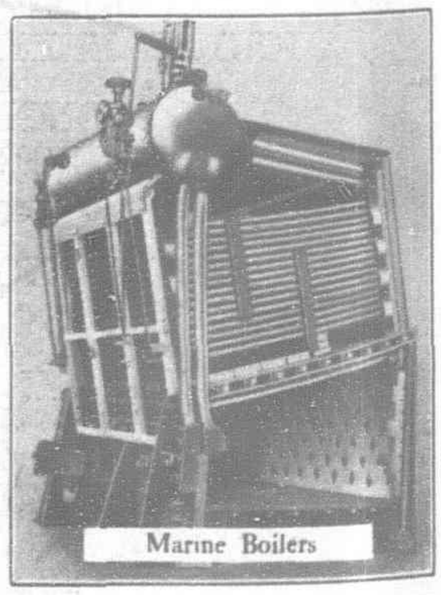

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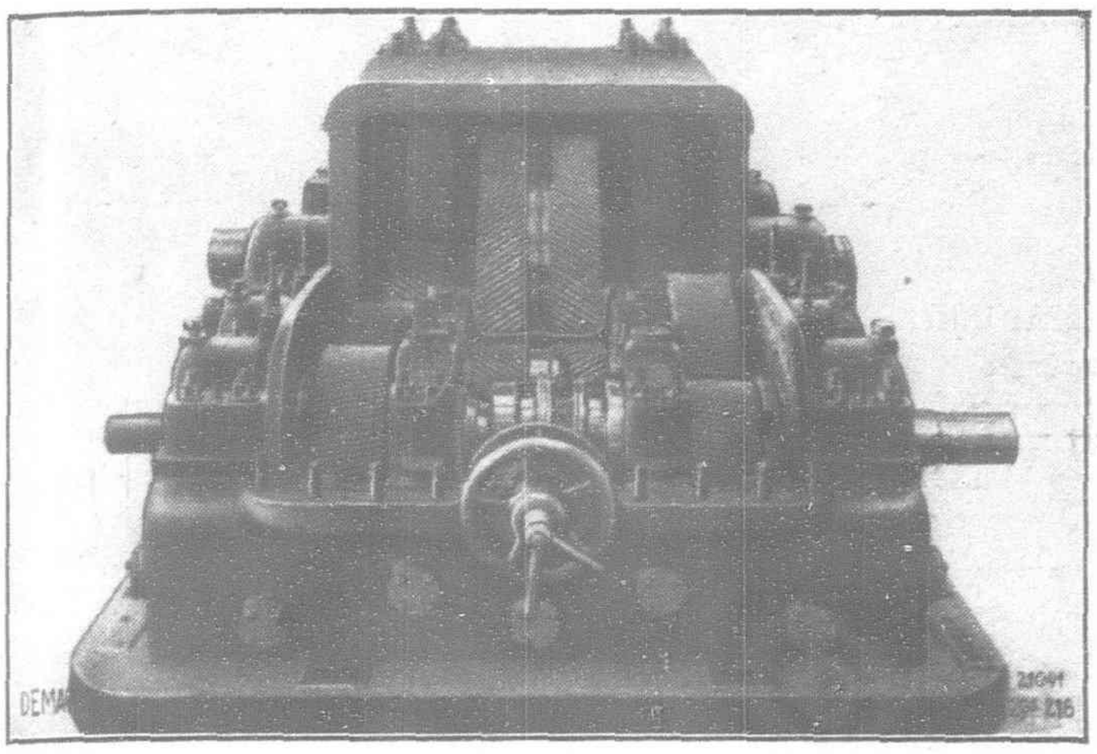

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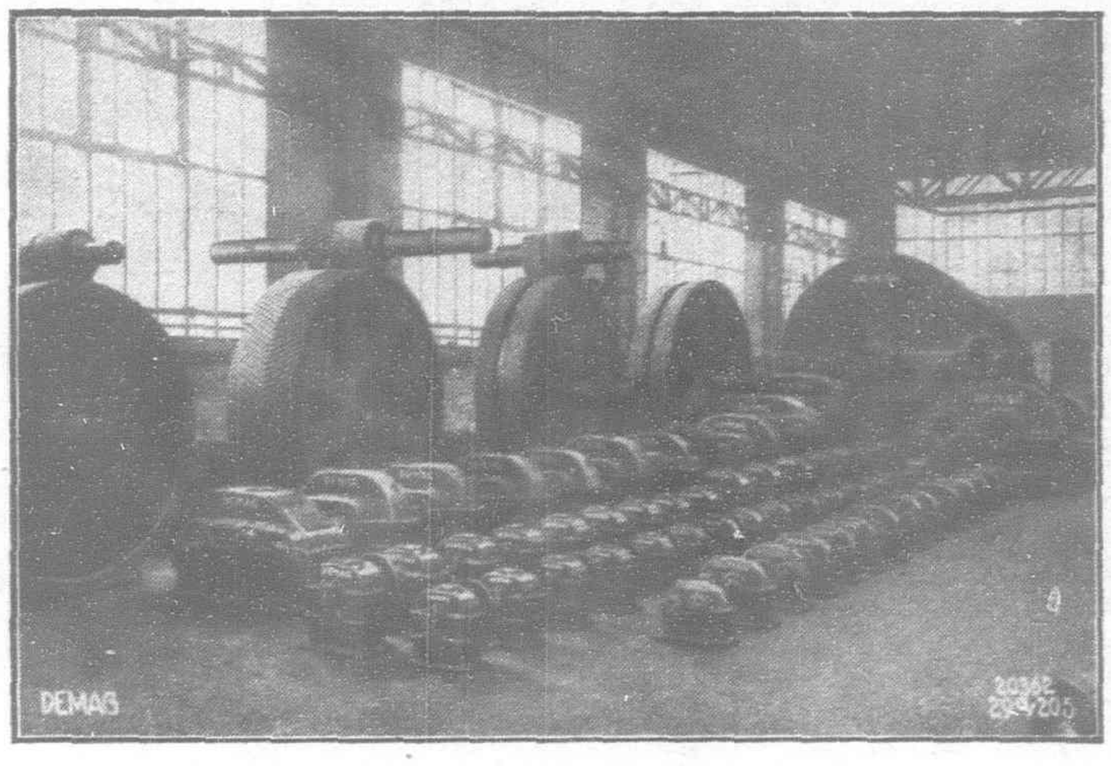

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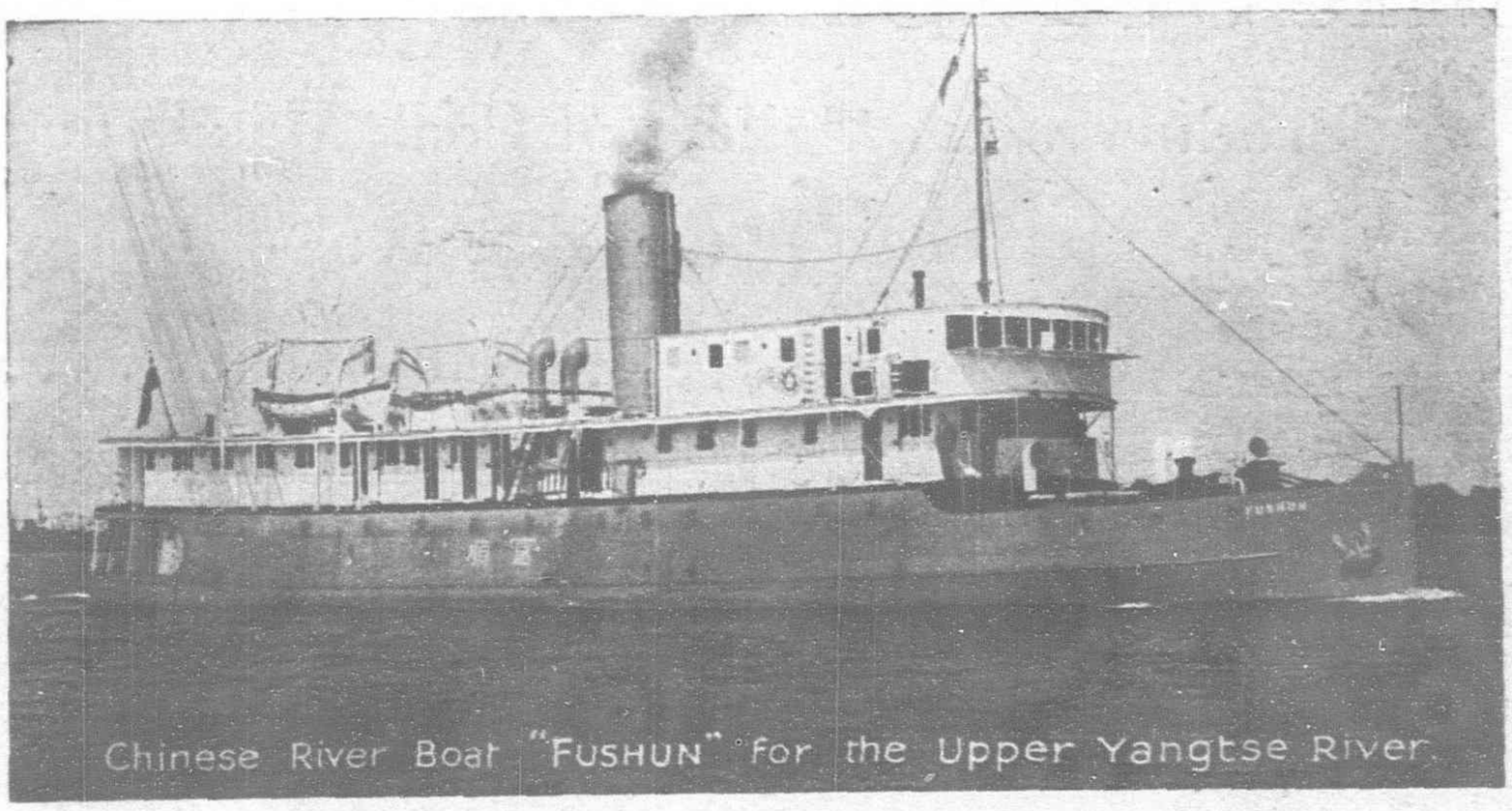
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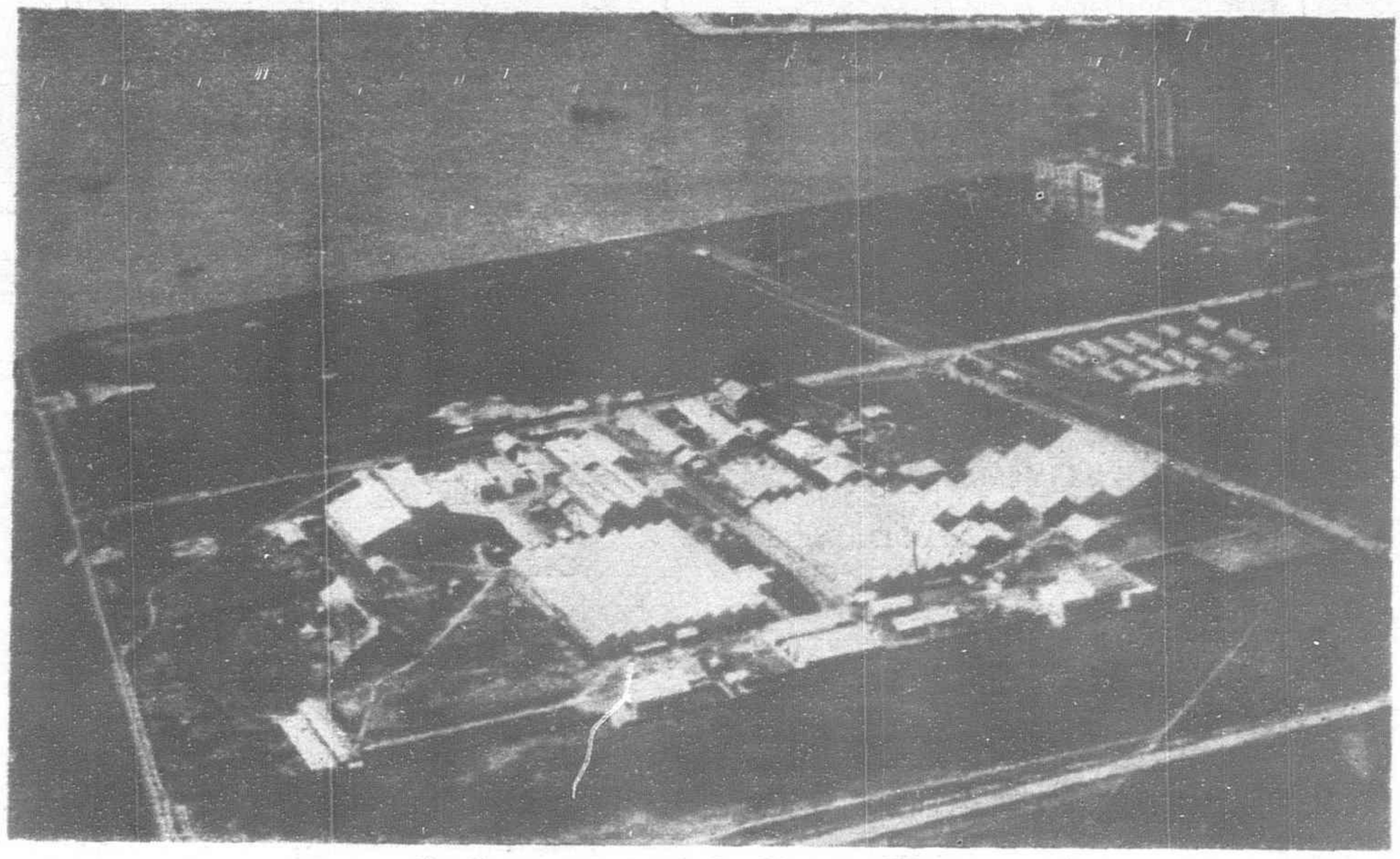
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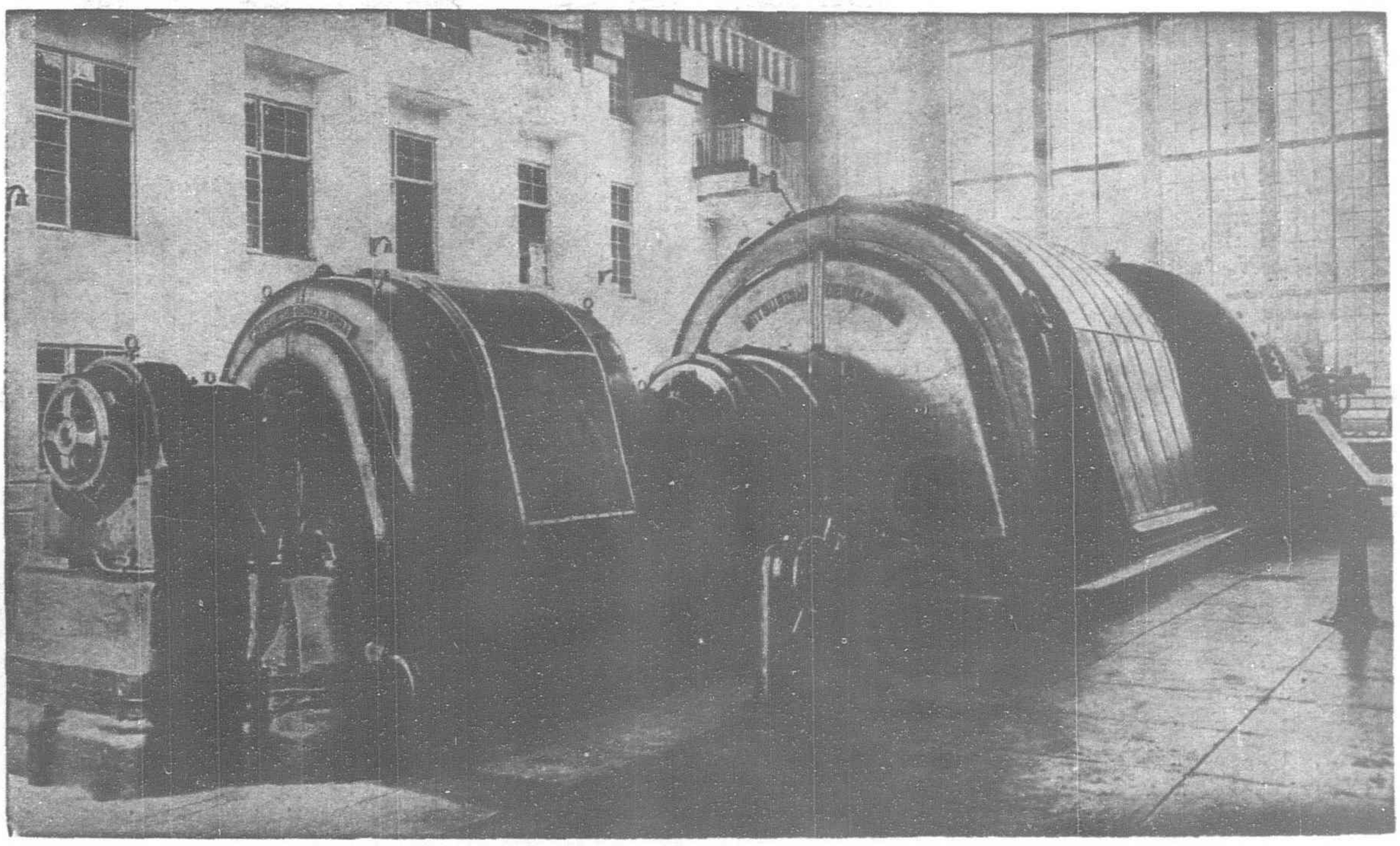
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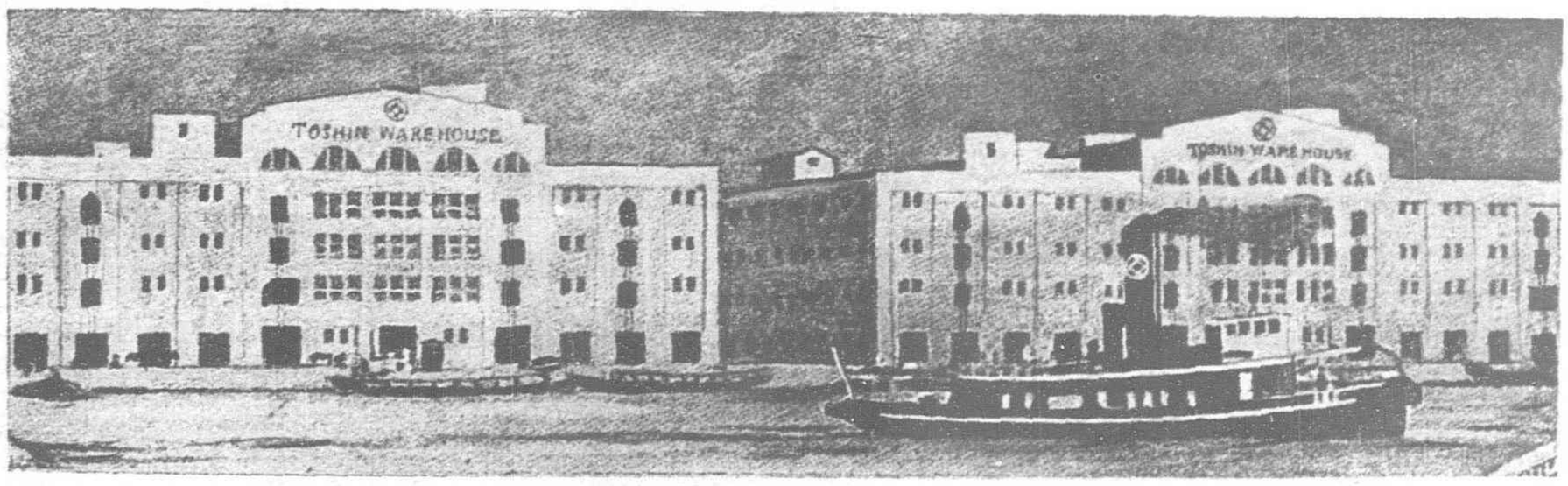
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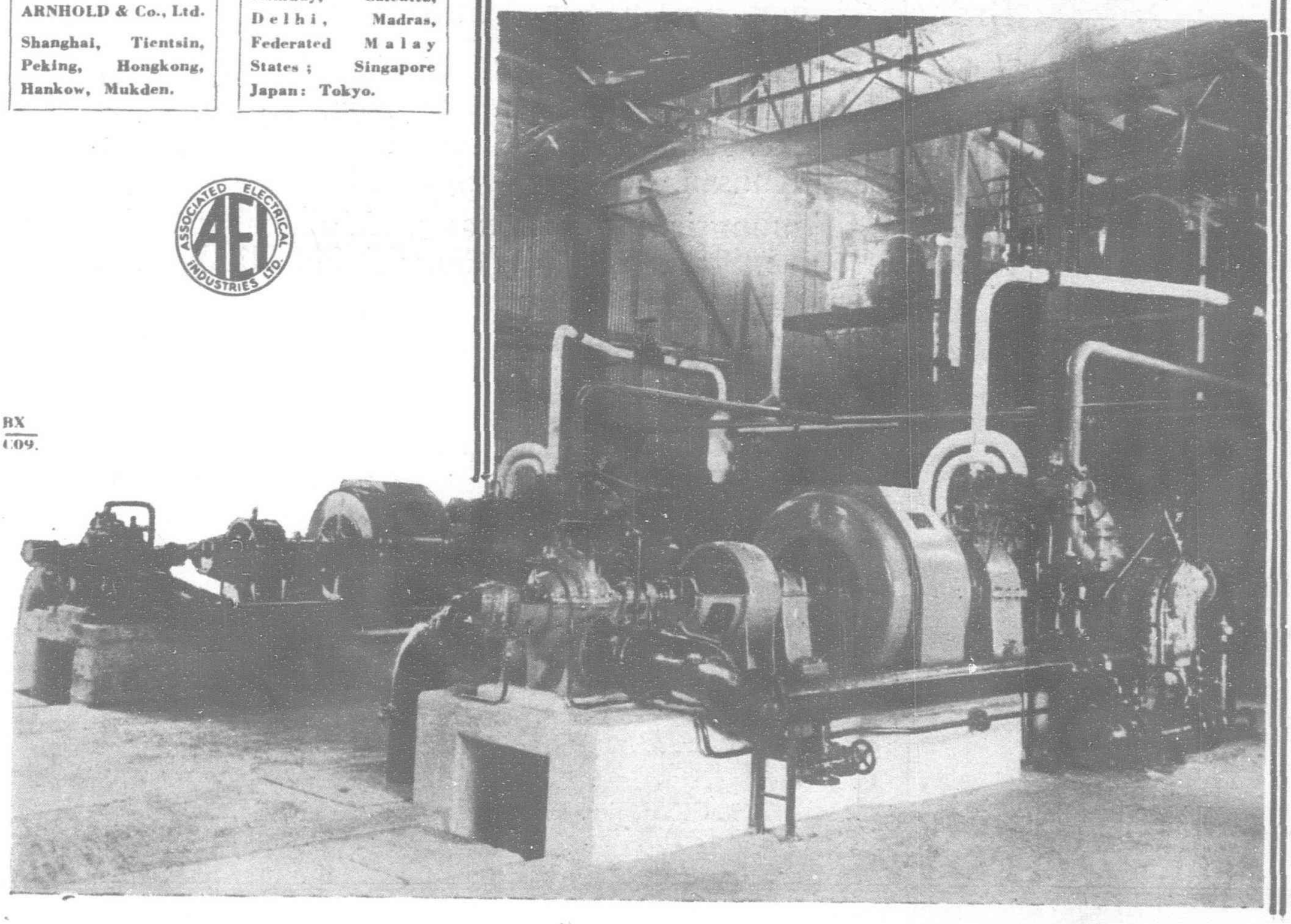
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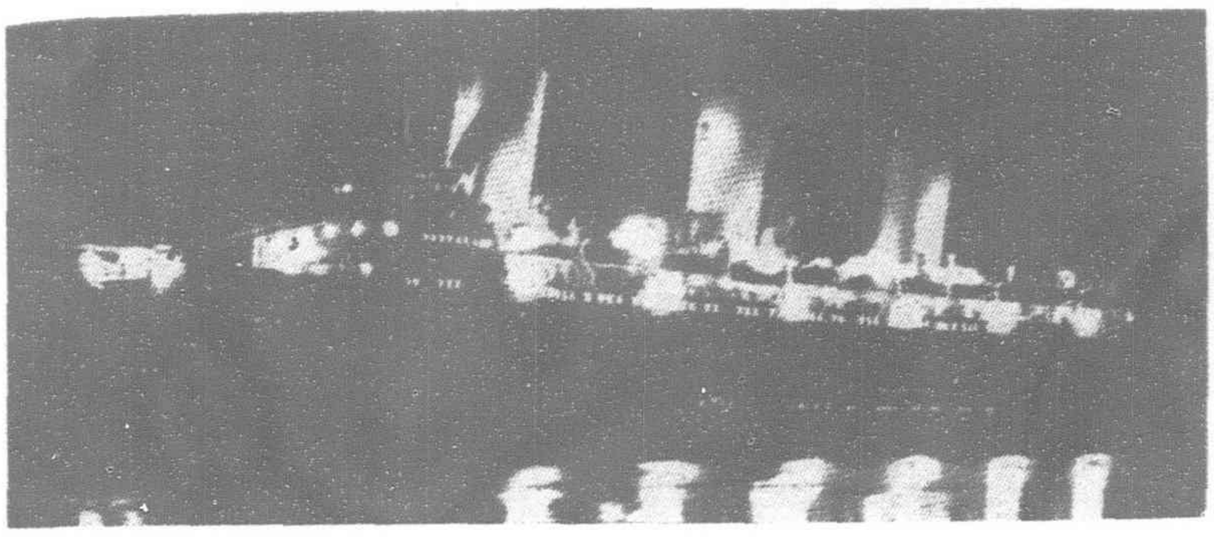
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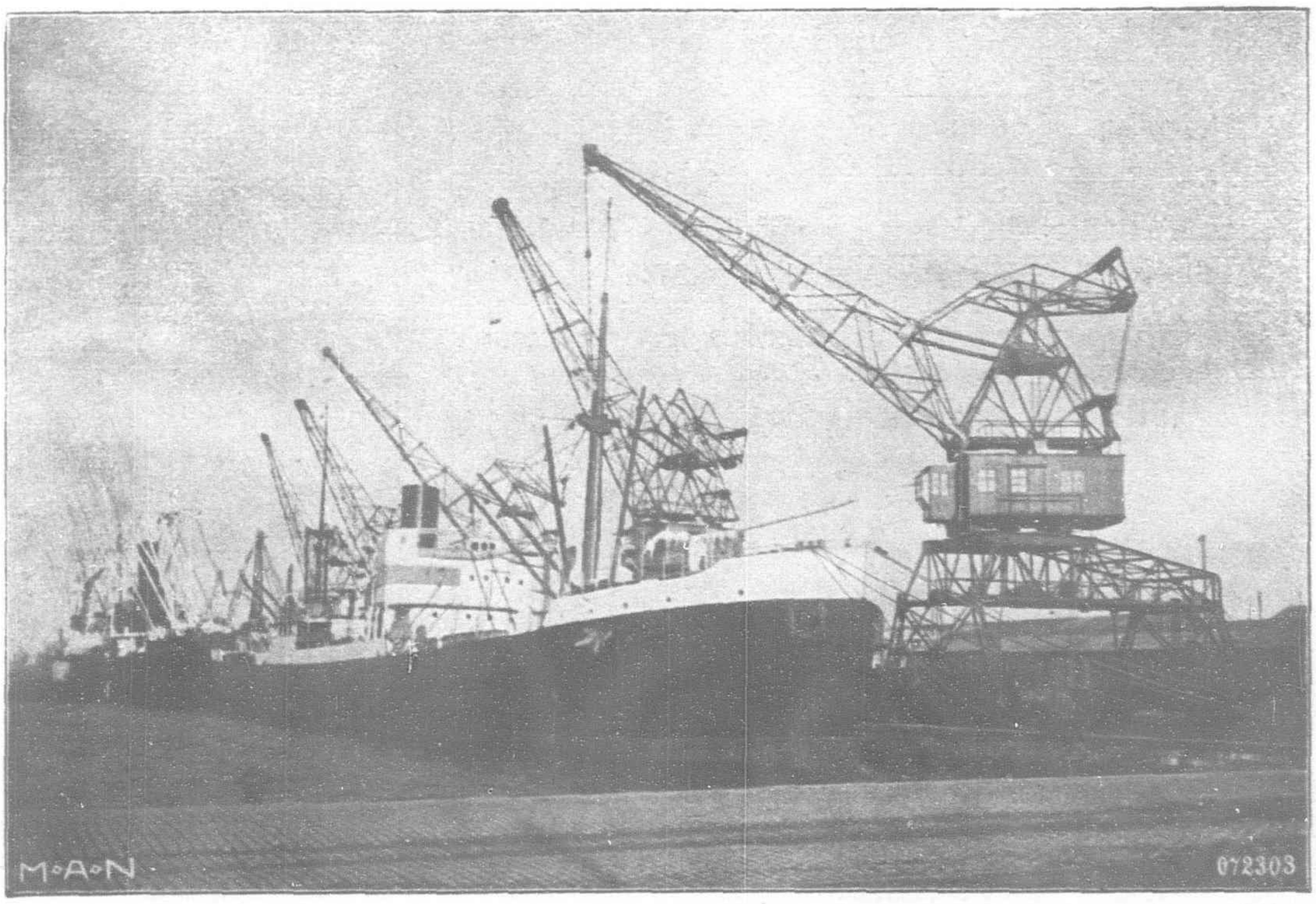
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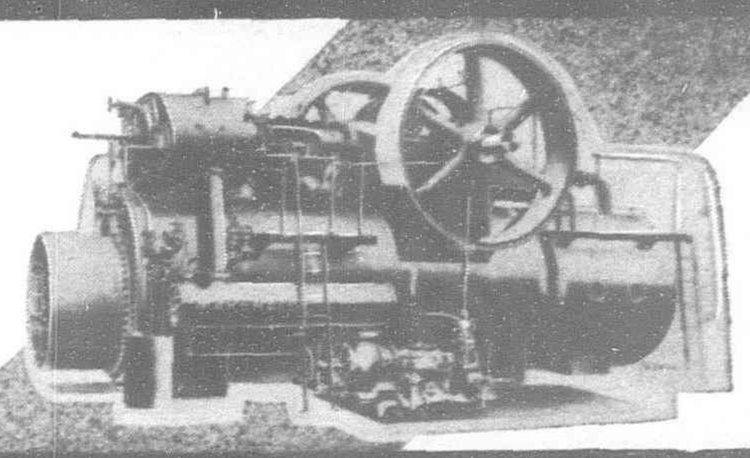
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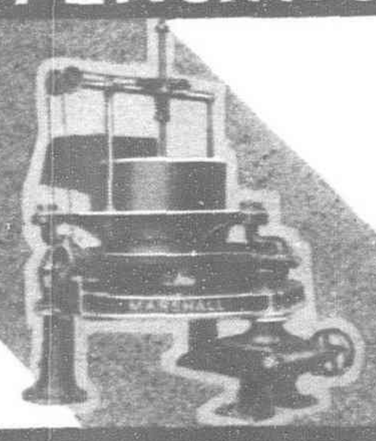
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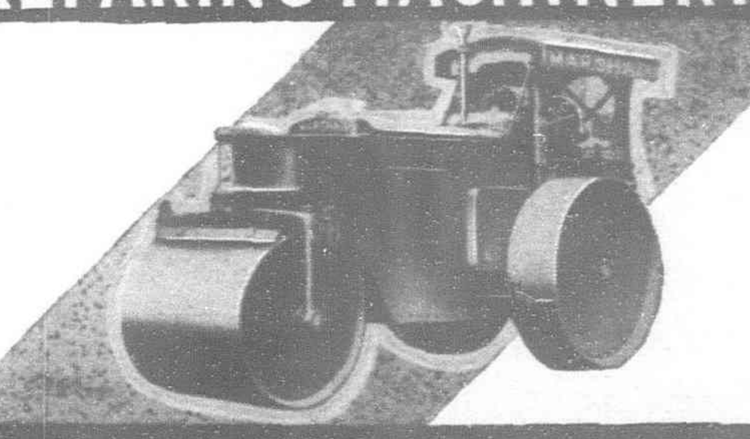
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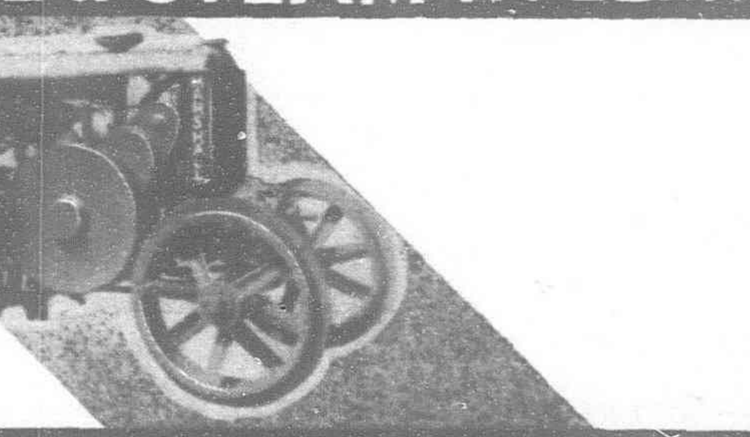
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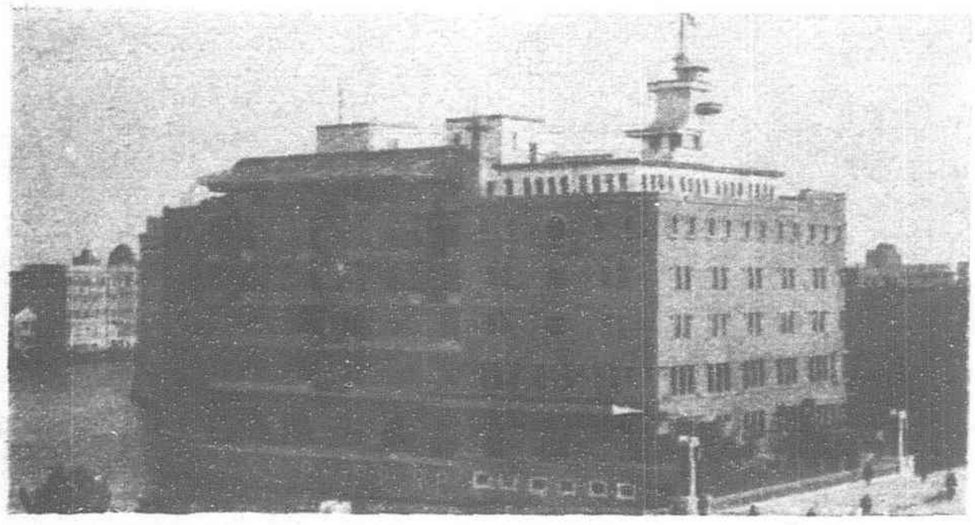
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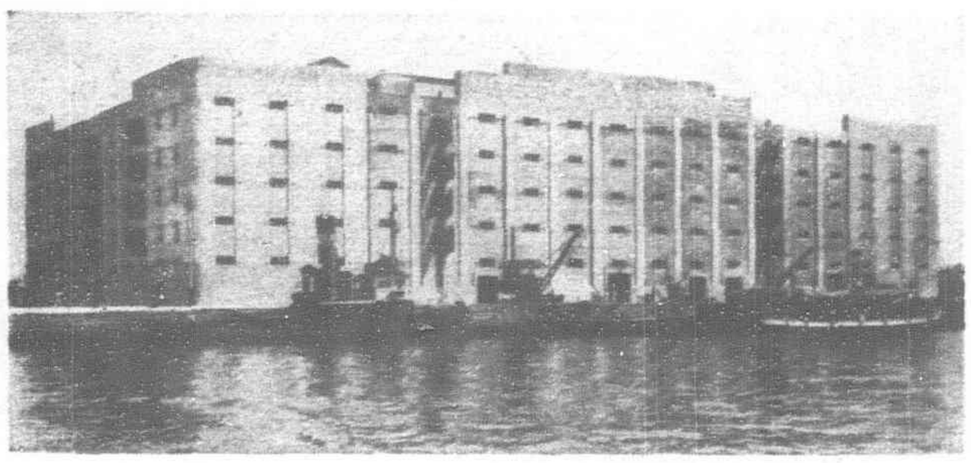
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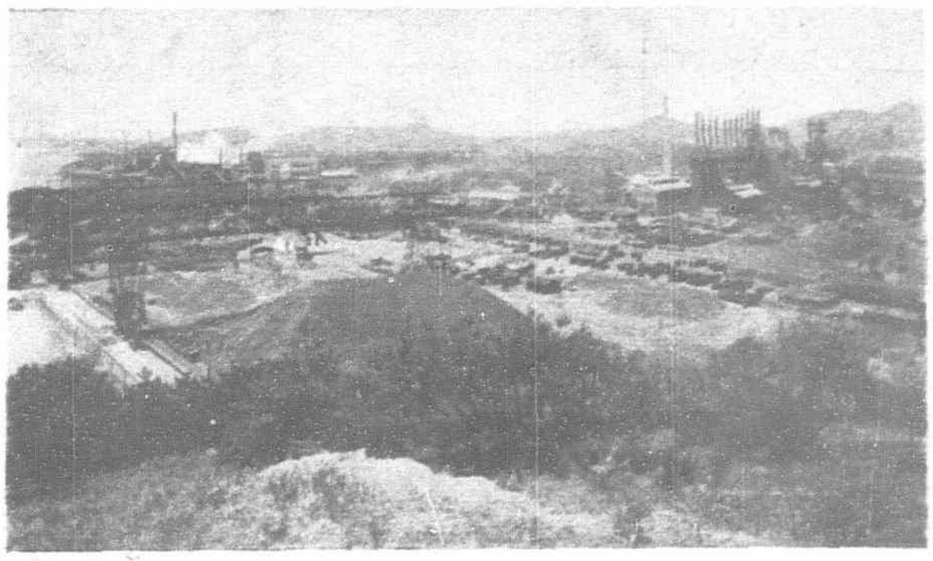
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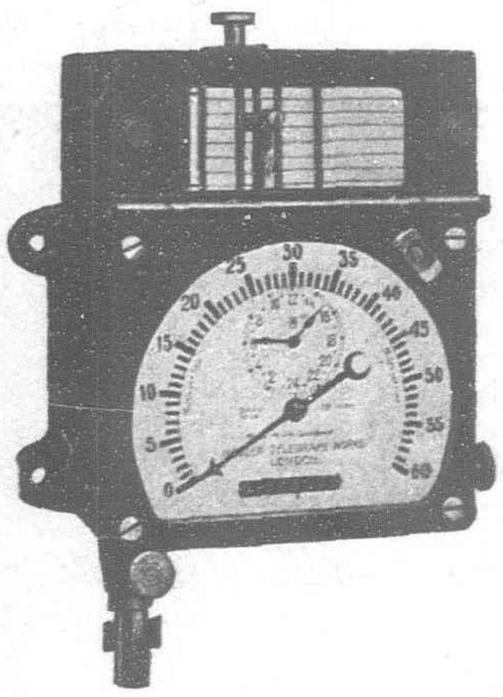
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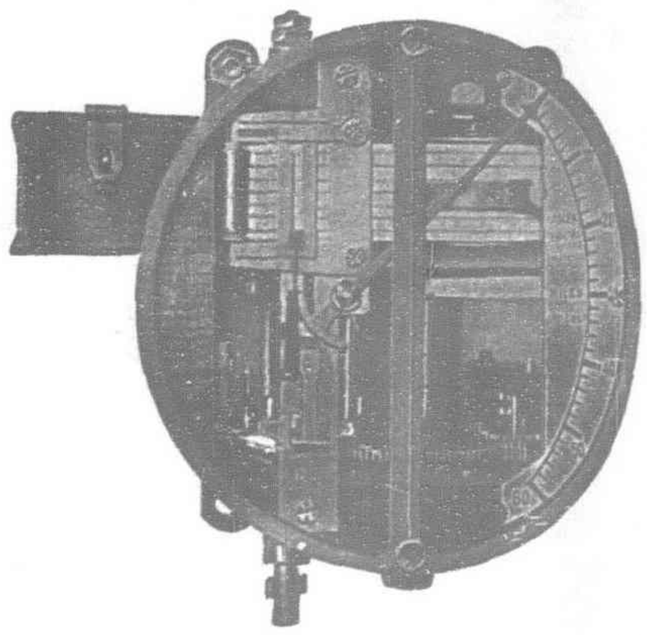
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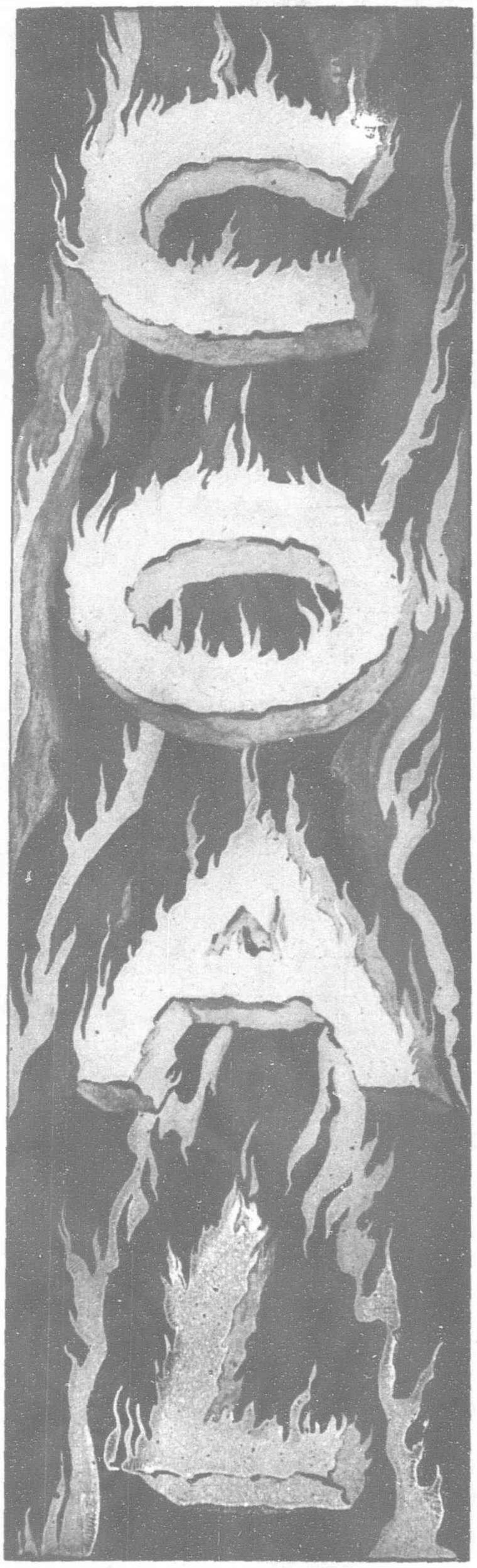
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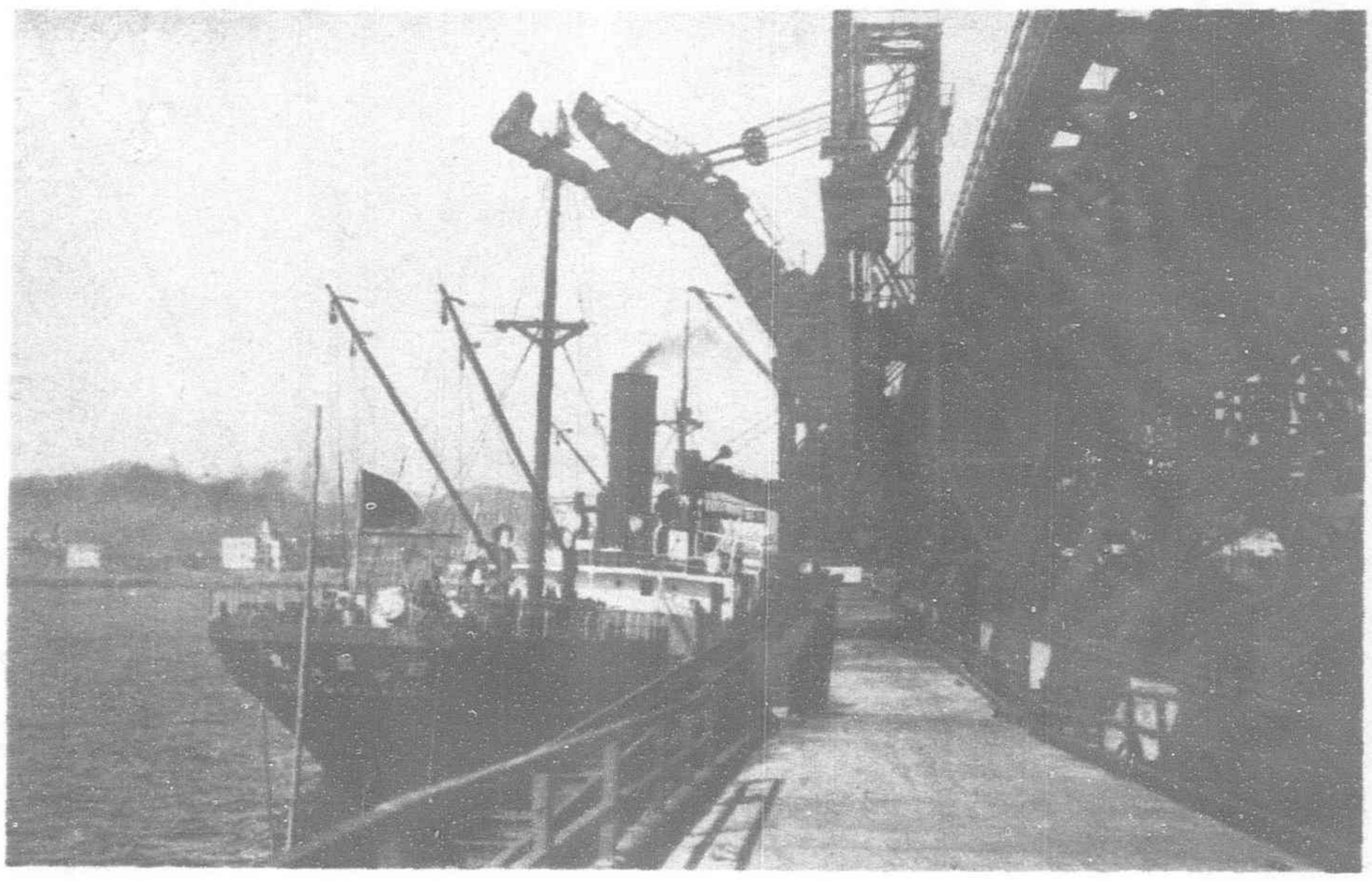
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Agencies: Chefoo, Manila, Batavia, South Seas, Moji, Takao (Formosa) Nagoya, Shanghai, Sourabaya, Singapore, Osaka, Hongkong, Penang, Yokohama, Niigata

Also Sulphate of Ammonia Fire Clay, and Talc

Pamphlets and Particulars gratis from any of the above Depots and Agencies, and from the

MINING DEPARTMENT :

South Manchuria Railway Company, Dairen

Mitsubishi Marine and Fire Insurance Co., Ltd.

(Mitsubishi Kaijo Kasai Hoken Kabushiki Kaisha)

Head Office: Marunouchi, Tokyo

Cable Address: "Insurer"

Capital - - - - Yen 5,000,000

Reserve Fund - - „ 12,380,000

Branches and Agencies:

LONDON, NEW YORK, OSAKA, KOBE, SHANGHAI, AND OTHER IMPORTANT CITIES AND PORTS OF THE WORLD

Mitsubishi Trust Co., Ltd.

Subscribed Capital - - Yen 30,000,000

Paid-up Capital - - - „ 7,500,000

Chairman:

Mr. Kenkichi Kagami

Managing Directors:

Mr. Hidemi Tamura

Mr. Yasuichi Miyagawa

Head Office:

No. 6 Marunouchi, Nichome, Koji-machi-ku, Tokyo.

Branch Office:

No. 1 Sozecho, Kita-ku, Osaka.

JAPANESE

TEXTILES FOR EXPORT

DAI NIPPON BOSEKI KAISHA

Established 1889

Capital - - - - - - - - - Y. 50,000,000

Reserve & Brought For'd. - Y. 46,017,000

MANUFACTURERS

of

All Sorts of Cotton Yarns and Cloths, Raw Silks and Spun Silks

Head Office

3-chome, Bingo-machi, Higashi-ku, OSAKA

President

Dr. K. KIKUCHI

Factories:

Fifteen Mills at Home and Two Mills in China

Number of Spindles: Cotton Yarn 993,700

Silk Yarn 47,500

Number of Weaving Machines: 9,100

NAIGAI WATA KABUSHIKI KAISHA

Established 1889

Capital - - - - - - - - Y. 33,000,000

Capital Paid-Up - - - - Y. 20,250,000

Reserve - - - - - - - - Y. 17,743,000

MANUFACTURERS

OF

COTTON YARN & CLOTH

Head Office

Dojima-kitamachi, Kitaku, OSAKA

Factories in China:

Shanghai, Tsingtao, Chin-chou

Total Plant Capacity

Number of Spindles: Spinning 477,160

Twisting 102,576

Number of Weaving Machines: 3,436

Dyeing and Finishing Plant: 2 works

JAPANESE

TEXTILES FOR EXPORT

Kanegafuchi Spinning Co., Ltd.

Head Office: MUKOJIMA, TOKYO, JAPAN
Business Office: HYOGO, KOBE

SILK
COTTON YARNS
NOILS, etc.

Reelers and Throwsters of Raw Silk; Manufacturers of all classes of Pure Silks; Spinners of all kinds of Cotton and Spun Silk Yarns; Manufacturers of all kinds of Cotton Cloth and Spun Silk Fabrics.

Printing, Dyeing, Bleaching and Finishing Works.

For Home and Foreign Markets.

OUR EXPORT DEPARTMENT
IS REPRESENTED IN ALL THE IMPORTANT COMMERCIAL CENTERS OF THE WORLD AND CAN FURNISH PROMPTLY FULL INFORMATION AND QUOTATIONS REGARDING THE LARGE VARIETY OF TEXTILES MADE IN OUR MILLS

Fuji Gassed Spinning Company, Ltd.

(Fuji Gasu Boseki Kabushiki Kaisha)

Capital: Yen 38,000,000

STANDARD PRINTED
and
DYED COTTON and
SILK FABRICS

SHIRTINGS
PRINTS
DAMASKS
PONGEES
CREPES
SHEETINGS
CRETONNES
TOWELLING
ETC. ETC.
BROCADES
SILKS
DRILLS
FLANNELETTES
CREPES
SATINS

Head Office:
GOCHOME, OSHIMA-MACHI, NEAR TOKYO
Cable Address "FUHO"
Business Office:
SAKAMOTOCHO, NIHONBASHI-KU, TOKYO

JAPANESE

TEXTILES FOR EXPORT

TOYO BOSEKI KAISHA

Manufacturers of

COTTON YARN; SHEETINGS, SHIRTINGS,
T-CLOTHS, DRILLS, JEANS, SATINS;
WHITE, DYED and PRINTED; SPUN SILK.

Head Office: DOJIMA HAMAORI, OSAKA.

President: FUSAJIRO ABE

FUKUSHIMA BOSEKI KABUSHIKI KAISHA

Established 1892

Capital... ... ...Yen 8,000,000
Capital Paid-up... „ 5,600,000
Reserve ... ... „ 12,491,045

Manufacturers of Cotton Thread and Cotton Cloth, T-Cloth, Drill and Cotton Shirtings

Head Office: Nichome, Tamayecho, Kitaku, Osaka, Japan

President: YUTARO YASHIRO

KURASHIKI BOSEKI KABUSHIKI KAISHA

Established 1887

Capital... ... ...Yen 17,200,000
Capital Paid-up... „ 12,350,000
Reserve ... ... „ 6,800,000

Cotton Spinners and Weavers

Head Office: Kurashiki, Kurashiki-shi, Okayama, Japan

President: MAGOSABURO OHARA

NISSHIN BOSEKI KABUSHIKI KAISHA

Established 1907

Capital... ... ...Yen 27,000,000
Capital Paid-up... „ 16,125,000
Reserve ... ... „ 4,880,594

Manufacturers of Cotton Yarn, Cloth and Shirtings

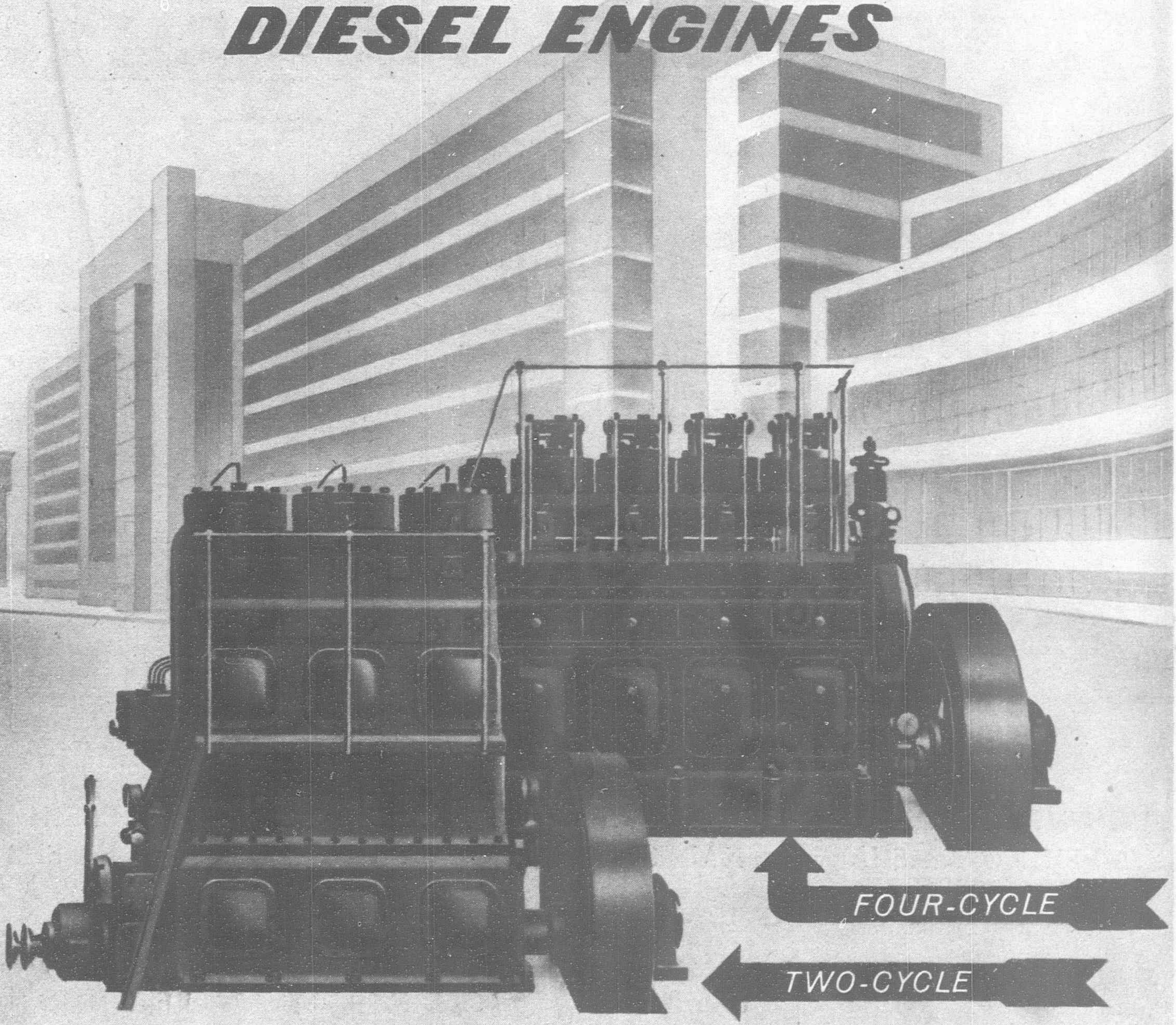
Head Office: Kameido-machi, Minami-katsushikagori, Tokyofu, Japan

President: SEIJIRO MIYAJIMA

STAUB

Sulzer

DIESEL ENGINES



WE CHOOSE THE MOST SUITABLE TYPE
FOR YOUR REQUIREMENTS

SULZER BROTHERS, LIMITED, WINTERTHUR (SWITZERLAND)

SHANGHAI: SULZER BROTHERS
Engineering Office - 4 Avenue Edward VII

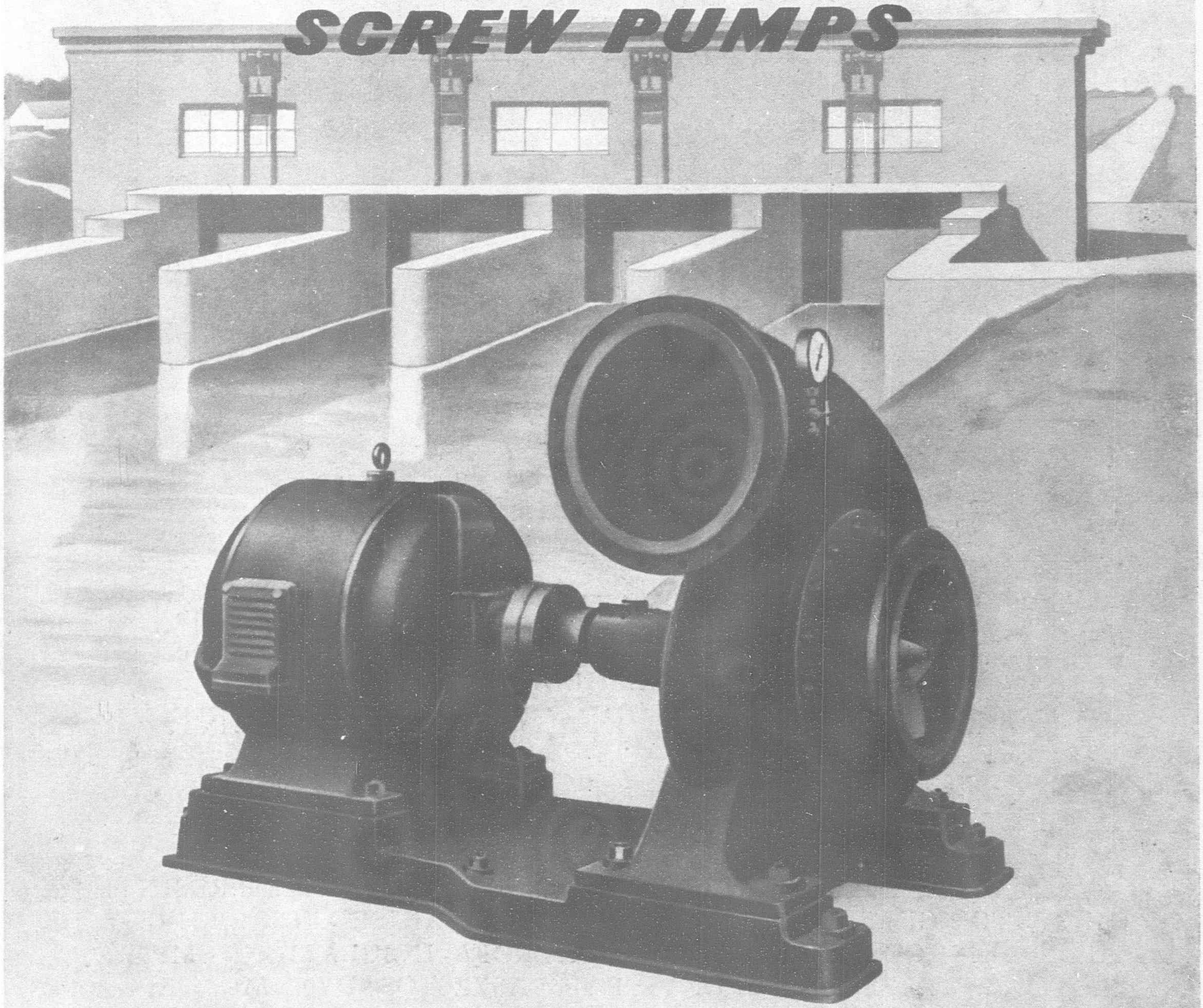
KOBE: SULZER BROTHERS
Engineering Office - 72 Kyo-Machi

25304

STAUB

Sulzer

SCREW PUMPS



FOR DRAINAGE, IRRIGATION, SEWAGE, WASTE WATER, ETC.

SULZER BROTHERS, LIMITED, WINTERTHUR (SWITZERLAND)

SHANGHAI: SULZER BROTHERS
Engineering Office - 4 Avenue Edward VII

KOBE: SULZER BROTHERS
Engineering Office - 72 Kyo-Machi

25305

F. L. SMIDTH & CO. A/S

COPENHAGEN

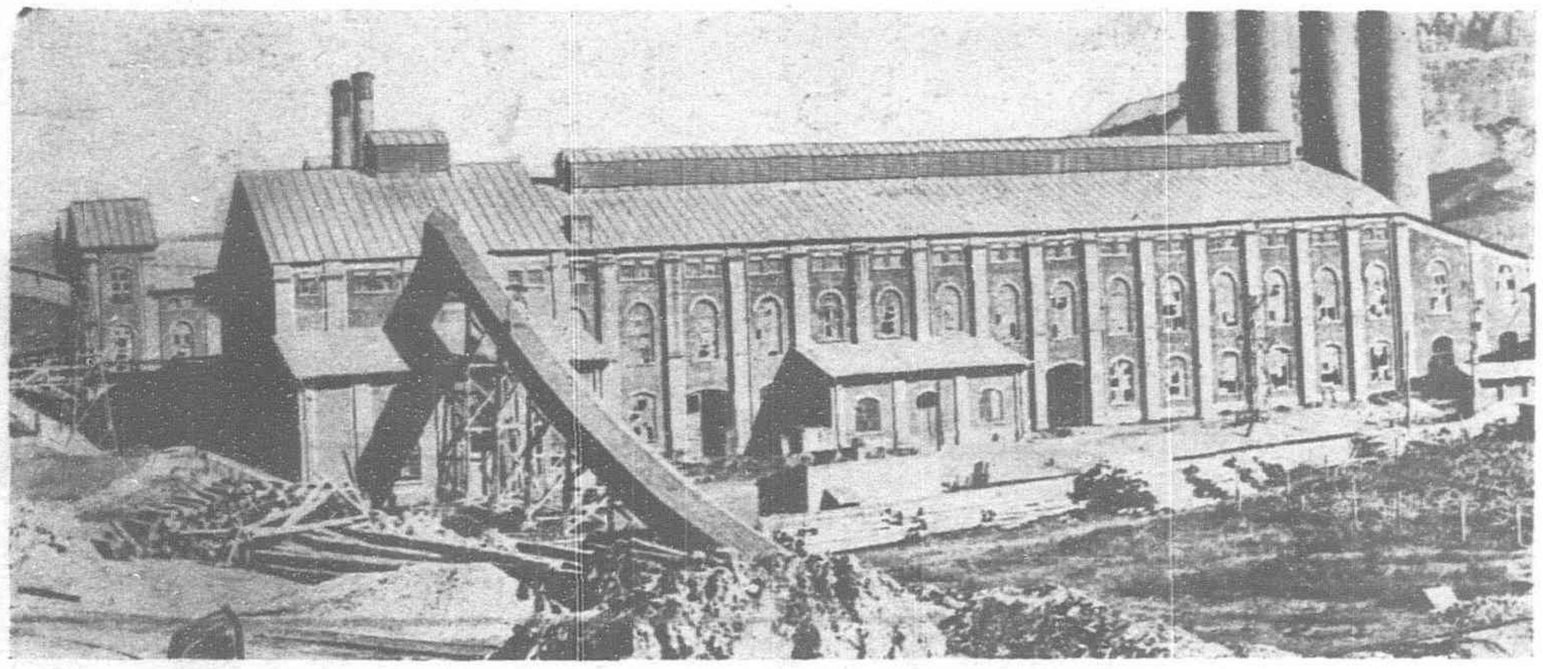
LONDON - NEW YORK - PARIS - TOKYO - TURIN - SAN FRANCISCO

SHANGHAI: Hongkong & Shanghai Bank Building, 1 Foochow Road

Telegraphic Address: "FOLASMIDTH"

DESIGNS AND COMPLETE EQUIPMENT FOR

PORTLAND CEMENT WORKS



Cement Works in Hungary, supplied with F. L. Smidth & Co. A/S Machinery

Grinding Machinery for all Purposes. Rotary Kilns for Burning Cement, Lime, and Magnesite and for Agglomeration of Iron Ore.

More than 470 Rotary Kilns, with a total yearly output of 126,000,000 Barrels, have been Supplied and more than 5,000 Grinding Plants equipped with our Machinery.

ATTWATER & SONS

ESTABLISHED 1868

Hopwood Street Mills, PRESTON, ENGLAND

MICA and MICANITE

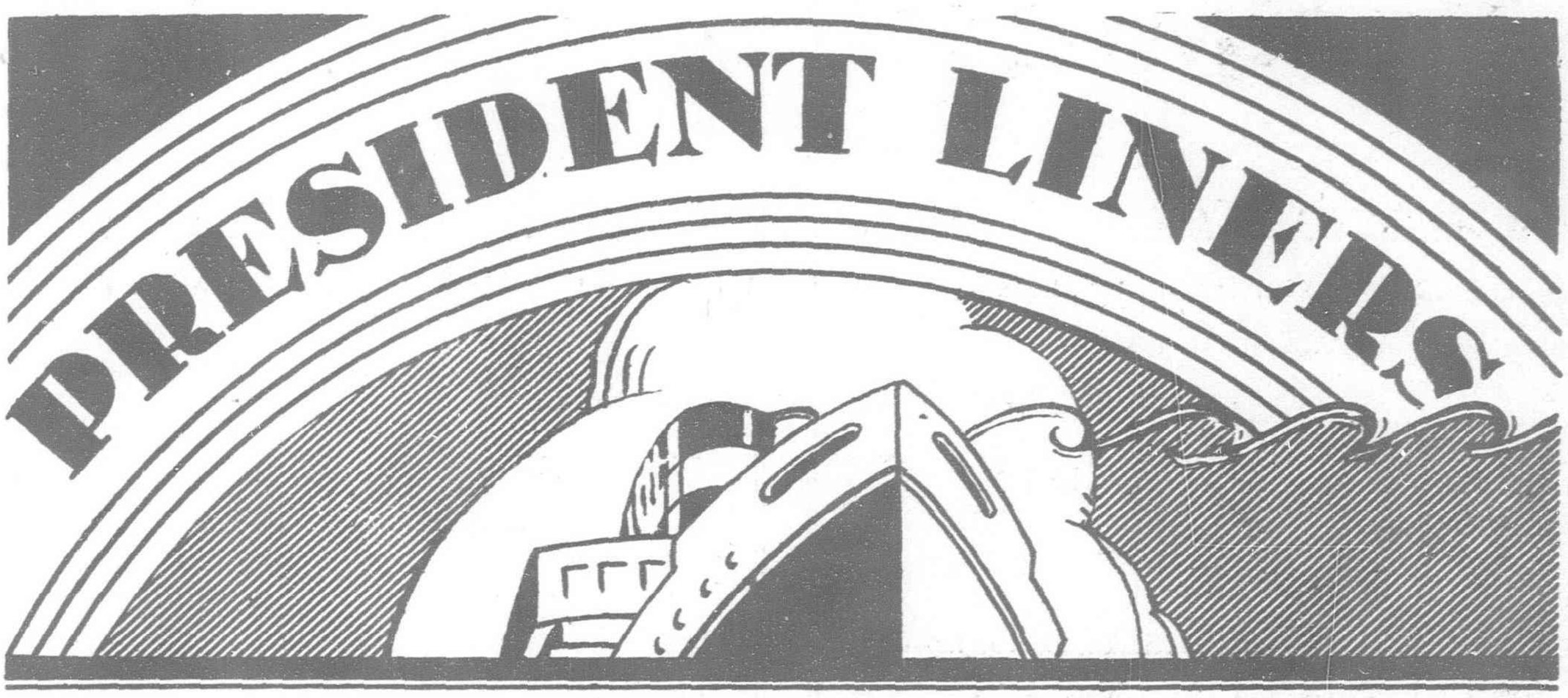
IN ALL FORMS AND QUALITIES.

BAKELITE SHEETS, TUBES, BOBBINS, VARNISH and RESIN for OIL SWITCH GEAR and TRANSFORMERS. VULCANISED FIBRE, SHEETS, TUBES and RODS. PEERLESS LEATHEROID INSULATION EMPIRE CLOTH and TAPES. COTTON and also ASBESTOS DYNAMO TAPES.

PRESSPAHN AND FULLERBOARD IN SHEET AND ROLLS



EBONITE AND ALL INSULATING MATERIAL FOR ELECTRICAL ENGINEERS



To EUROPE . . . .
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PRESIDENT Liners offer a varied selection of services enabling you to select the route you desire, either first or special class. THE SUNSHINE ROUTE—via Japan, Hawaii, California, the Panama Canal, Cuba, New York, or ACROSS AMERICA—using any one of the 12 trans-continental rail lines, each offering their different points of interest—then from the Atlantic Seaboard, your choice of any trans-Atlantic steamer, either first or cabin class. THE EXPRESS ROUTE—via Japan direct to Seattle, either first or special class, and your choice of rail routes across America—and then through to Europe on any Atlantic steamer you choose, either first or cabin class. To lend variety to your trip, you have the option of going by one route and returning by another. President Liners offer you real travel economy, with all that their reputation implies— luxurious comfort, excellence of cuisine, courtesy, service, entertainment. Ask for complete particulars concerning our special reduced fares.

FARES

ONE WAY

First Class as low as £95

Special and Cabin Class as low as £65

ROUND TRIP

First Class as low as £172

Special and Cabin Class as low as £128



NIPPON MENKWA KABUSHIKI KAISHA

(JAPAN COTTON TRADING CO., LTD.)

ESTABLISHED 1892

COTTON, COTTON YARN, PIECE-GOODS, RAW SILK, WOOL, JUTE, RICE, RAYON AND GENERAL COMMISSION MERCHANTS

Capital Subscribed - - - Yen 20,000,000.00
Capital Paid-up - - - Yen 10,400,000.00

Head Office:

No. 10 Nichome, Nakanoshima, Kitaku, Osaka, Japan.

Branches:

Yokohama, Dairen, Shanghai, Hankow, Tsingtau, Bombay and Rangoon.

Agencies and Correspondents:

Kobe, Nagoya, Tokyo, Seoul, Mokpo, Mukden, Hsinking, Tientsin, Tsinan, Changtien, Hongkong, Calcutta, Karachi, Soerabaja, Sydney, Mombasa, Alexandria, Liverpool, Bremen, Hamburg, Milan, New York, Dallas

MEIJI SEITO KABUSHIKI KAISHA

(MEIJI SUGAR MANUFACTURING CO., LTD.)

Established 1906

HANJI SOMA, *President*

Authorized Capital - - Y.48,000,000
Paid-up Capital - - - Y.34,800,000

Headquarters:
TAINAN-SHU, FORMOSA

Tokyo Office:
No. 1, 1-CHOME, YURAKUCHO

ASAHI BEER





TRADE MARK

PURE CANE SUGAR

Raw and Refined—Fuji Brand Cube and Granulated

ALCOHOL

ESTABLISHED 1900

CAPITAL . . . . Yen 63,000,000

13 Raw Sugar Mills in Formosa—Two Refineries on Mainland

TAIWAN SEITO KABUSHIKI KAISHA

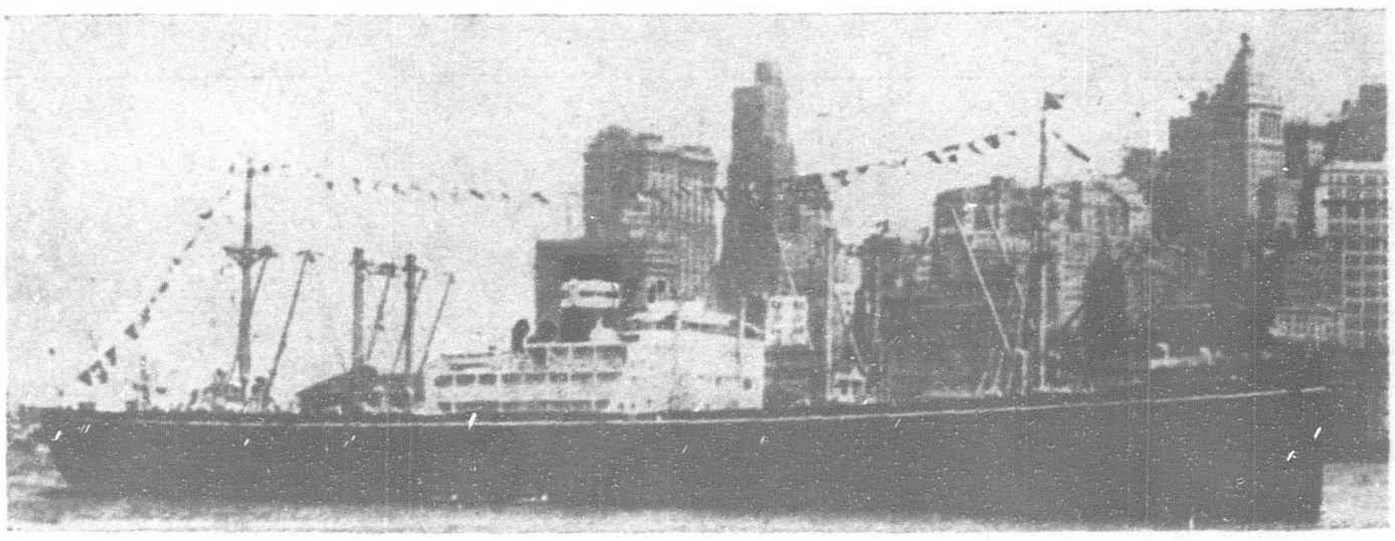
(Formosa Sugar Manufacturing Co., Ltd.)

Head Office : Heito, Formosa, Japan.
Tokyo Office : Yuraku Building, Marunouchi TOKYO, JAPAN.

O.S.K. LINE

OFFICES AND AGENTS IN CHINA

Shanghai, Hongkong, Swatow, Amoy, Canton, Foochow, Hankow, Tsingtao, Chefoo and Dairen



M. V. " Kinai Maru " One of Eight Sister Boats on the New York Express Freight Service

50 Mail, Passenger and Freight Services with a Fleet of 150 Vessels aggregating 550,000 Tons.

NEW YORK LINE EXPRESS SERVICE

New York, Philadelphia, Boston, Baltimore, Los Angeles and Panama Canal—Far East. (FORTNIGHTLY SERVICE)

Shanghai—36 Days—New York. New York—41 Days—Shanghai

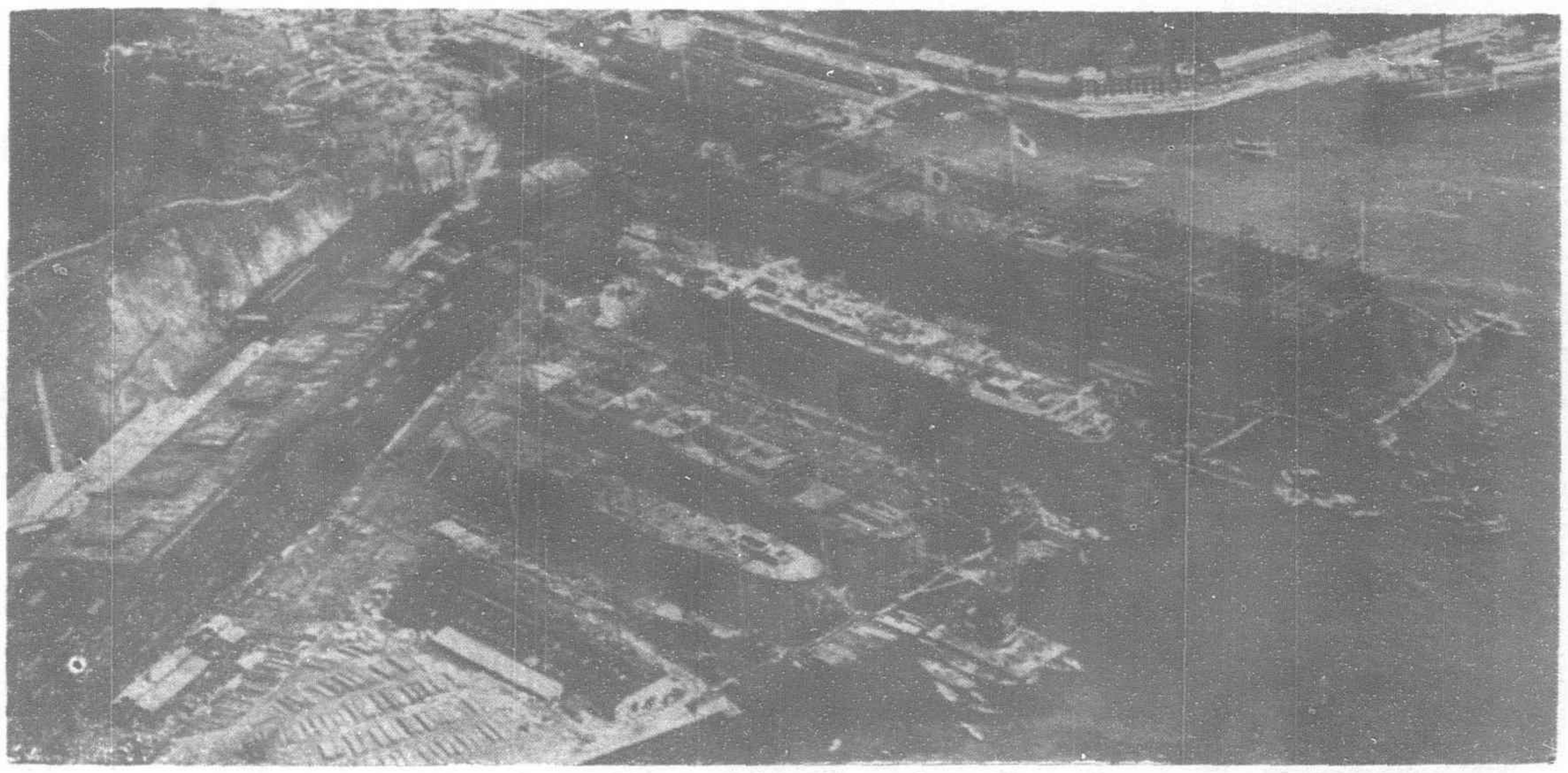
Shanghai to Foochow, Keelung, Takao, Tsingtao, Tientsin and Dairen *(Every 10 Days Service)*

Principal Regular Ocean Lines

South American Line - - - *Monthly*	South Sea Line - - - *2 times a Month*	Saigon-Bangkok Line - *2 times a Month*
African Line - - - - *Monthly*	Bombay Line - - - *2 times a Month*	Philippine Line - - *Fortnightly*
Australian Line - - - - *Monthly*	Japan-Calcutta Line - - *2 times a Month*	

Chinese Service

Osaka-Dairen Line - - *Daily Sailing*	Yokohama-Tientsin Line - *6 times a Month*	Keelung-Hongkong Line - - *Weekly*
Osaka-Tientsin Line - *7 times a Month*	Keelung-Foochow-Amoy Line *3 times a Month*	Takao-Canton Line - - - *Fortnightly*



Aerial View of the Shipyards at Nagasaki

MITSUBISHI ZOSEN KAISHA, LTD., NAGASAKI WORKS

(ex Mitsubishi Dockyard and Engine Works, Nagasaki)

DOCK No. 1		DOCK No. 2		DOCK No. 3	
Extreme Length	523 Ft.	Extreme Length	371 Ft.	Extreme Length	728.9 Ft.
Length on Blocks	513 ,,	Length on Blocks	350 ,,	Length on Blocks	714 ,,
Width of Entrance on Top	89 ,,	Width of Entrance on Top	66 ,,	Width of Entrance on Top	99½ ,,
Width of Entrance on Bottom	77 ,,	Width of Entrance on Bottom	53 ,,	Width of Entrance on Bottom	88½ ,,
Water on Blocks at Spring Tide	26½ ,,	Water on Blocks at Spring Tide	24 ,,	Water on Blocks at Spring Tide	34½ ,,

THE BEST EQUIPPED SHIPBUILDING PLANT IN THE FAR EAST

With Special Facilities for Handling the Heaviest Castings and the Repairing or Building of Ships, Engines and Boilers
Also Electric Work

LARGE STOCK OF MATERIAL AND FITTINGS ALWAYS ON HAND

Hongkong and Shanghai Banking Corporation

(INCORPORATED IN HONGKONG)

Capital: Authorised Capital $50,000,000
Issued and fully paid-up .. $20,000,000

Reserve Funds: Sterling £6,500,000
Silver $10,000,000
Reserve Liability of Proprietors $20,000,000

Board of Directors

T. E. PEARCE, Esq., Chairman
T. H. R. SHAW, Esq., Deputy Chairman
J. K. BOUSFIELD, Esq.
A. H. COMPTON, Esq.
STANLEY H. DODWELL, Esq.
Hon. Mr. C. G. S. MACKIE
G. MISKIN, Esq.
Hon. Mr. J. J. PATERSON
J. A. PLUMMER, Esq.

Head Office:
HONGKONG

Chief Manager:
V. M. GRAYBURN, Esq., Hongkong

London Branch:
9 Gracechurch Street, E.C.3

Shanghai Branch: 12 The Bund
Sub-Agency: 27 Broadway

Branches and Agencies:

AMOY	ILOILO	NEW YORK
BANGKOK	IPOH	PEIPING
BATAVIA	JOHORE	PENANG
BOMBAY	KOBE	RANGOON
CALCUTTA	KOWLOON	SAIGON
CANTON	(Hongkong)	S. FRANCISCO
CHEFOO	KUALA	SHANGHAI
COLOMBO	LUMPUR	SINGAPORE
DAIREN	LONDON	SOURABAYA
FOOCHOW	LYONS	SUNGEIPATANI
HAIPHONG	MALACCA	TIENTSIN
HAMBURG	MANILA	TOKYO
HANKOW	MOUKDEN	TSINGTAO
HARBIN	MUAR(Johore)	YOKOHAMA

Interest allowed on Current Accounts and on Fixed Deposits according to arrangement.

Local Bills Discounted. Credits granted on approved Securities and every description of Banking and Exchange business transacted. Drafts granted on London and the chief commercial places in Europe, India, Australia, Africa, China, Japan and America. Safe Deposit Boxes to rent. Terms on application.

SAVINGS BANK OFFICE

Accounts will be kept in Dollars Local Currency.
Deposits of less than $1 will not be received.
Not more than $200 will be received during one month from any single Depositor.
Interest at the rate of 2½% per annum will be allowed upon the monthly minimum balance.
The maximum balance on which interest will be allowed is $5,000.
Deposits may be withdrawn on Demand.
Depositors will be provided with Pass Books in which all transactions will be entered. Pass Books must be presented when paying in or withdrawing money.

Office Hours—10 a.m. to 3 p.m. Saturdays 10 a.m. to Noon.

A. S. HENCHMAN, *Manager.*

The Kawasaki-One Hundredth Bank, Ltd.

HEAD OFFICE: YOROZU-CHO, TOKYO

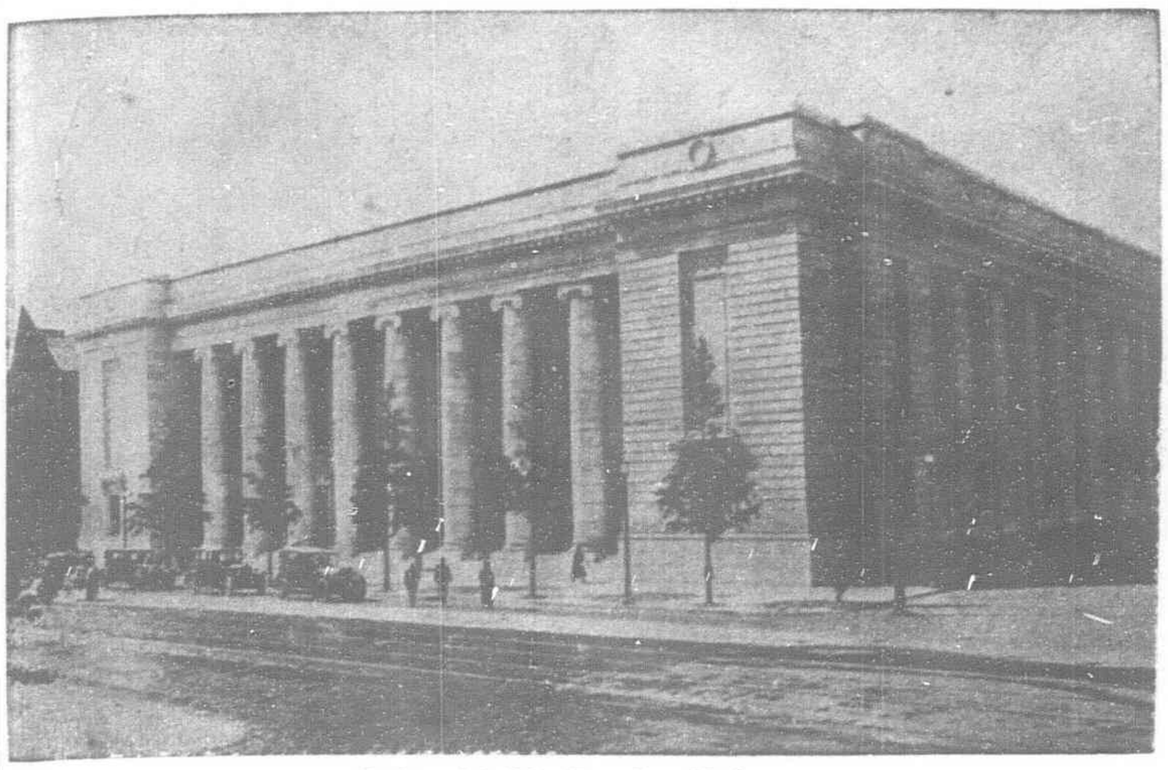
Phone: Nihombashi 141, 3105

SHO HOSHINO, ***President***

Special facilities offered for foreign residents and corporations in Japan
Interest allowed on current and time deposits. Safe deposit box rented

BRANCHES AND AGENCIES:

Yokohama, Kobe, Kyoto, Osaka and 78 others in principal cities in Japan



Mitsubishi Bank, Tokyo

THE MITSUBISHI BANK, LIMITED

CAPITAL SUBSCRIBED - Yen 100,000,000
CAPITAL PAID-UP - - Yen 62,500,000

CHAIRMAN:

Mr. Manzo Kushida

MANAGING DIRECTORS:

Mr. Kiyoshi Sejimo Mr. Takeo Kato
Mr. Sobun Yamamuro

HEAD OFFICE:

No. 5, Marunouchi, Nichome, Kojimachi-ku, Tokyo.

BRANCHES HOME:

Eitaibashi (Tokyo), Tokio Kaijo Building (Tokyo), Marunouchi Building (Tokyo), Nihonbashi (Tokyo), Yotsuya (Tokyo), Komagome (Tokyo), Nihonbashi-Toricho (Tokyo), Kanda (Tokyo), Shinagawa (Tokyo), Omori (Tokyo), Osaka, Nakanoshima (Osaka), Senba (Osaka), Nishinagahori (Osaka), Kobe, Sannomiya (Kobe), Kyoto, Nagoya, Otaru.

BRANCHES OVERSEAS:

Shanghai Office : No. 2, Kiukiang Road, Shanghai.
London Office : No. 3, Birchin Lane, Cornhill, London, E.C.3.
New York Office : No. 120, Broadway, New York.



Mitsui Bank, Tokyo

THE MITSUI BANK, LTD.

The Oldest Bank in Japan, Founded in 1673

Capital Subscribed.....Y. 100,000,000
Capital Paid-Up.....Y. 60,000,000
Reserve Funds.....Y. 65,200,000

HEAD OFFICE: TOKYO
No. 1 Surugacho, Nihonbashi-ku

Home Branches:

FUKUOKA, HIROSHIMA, KOBE, KYOTO, MARUNOUCHI (Tokyo), MOJI, NAGASAKI, NAGOYA, NIHONBASHI (Tokyo), OSAKA, OSAKA - DOJIMA, OSAKA - KAWAGUCHI, OSAKA - NISHI, OTARU, SHIMONOSEKI, WAKAMATSU (Kyushu), YOKOHAMA.

Foreign Branches:

Bombay, London, New York, Shanghai, Sourabaya.

London Bankers:

Barclays Bank, Ltd. Midland Bank, Ltd.

New York Bankers:

Bankers Trust Co. Chase National Bank.
National City Bank of New York.

CAPITAL PAID YEN 150,000,000

SUMITOMO GOSHI-KAISHA

OSAKA, JAPAN

OWNERS OF COPPER MINES, SILVER AND GOLD MINES AND COAL MINES, ETC.

OFFICES AND DEPARTMENTS

Mining Offices ... ... Kohnomai & Ohgayu
Forestry Department ... ... Osaka

Sales Departments... ... Osaka, Tokyo, Yokosuka, Nagoya, Kobe, Kure, Hakata, and Shanghai

The Sumitomo Steel Works, Limited
OSAKA, JAPAN
Capital Subscribed: Yen 12,000,000

The Sumitomo Electric Wire & Cable Works, Ltd.
OSAKA, JAPAN
Capital Subscribed: Yen 15,000,000

The Sumitomo Steel Tube & Copper Works, Ltd.
OSAKA, JAPAN
Capital Subscribed: Yen 15,000,000

The Sumitomo Fertilizer Works, Limited
Capital Subscribed: Yen 10,000,000
Head Office: Osaka, Japan Works: Niihama, Iyo, Japan

The Sumitomo Besshi Mine, Limited
Capital Paid: Yen 15,000,000
Head Office: Niihama, Iyo, Japan Branch: Osaka, Japan

The Sumitomo Warehouse Company, Limited
Capital Paid: Yen 15,000,000
Head Office: Osaka, Japan Branches: Osaka, Kobe & Tokyo

The Sumitomo Trust Company, Limited
Capital Subscribed: Yen 20,000,000
Head Office: Osaka, Japan Branches: Tokyo & Fukuoka, Japan
Authorized to Exercise all Trust Powers for Individuals and Corporations.

The Sumitomo Life Insurance Company, Limited
OSAKA, JAPAN
Capital Subscribed: Yen 1,500,000

The Sumitomo Collieries, Limited
Capital Paid: Yen 15,000,000
Head Office: Osaka, Japan Branches: Wakamatsu & Otaru

ESTABLISHED: 1895 INCORPORATED: 1912

THE SUMITOMO BANK, LTD.

KITAHAMA, OSAKA, JAPAN

Subscribed Capital .. .. Yen 70,000,000 Paid-up Capital .. .. Yen 50,000,000
Reserve Funds .. .. Yen 31,260,000

DIRECTORS:

N. YATSUSHIRO, Esq.	.. Chairman, Board of Directors and Chief Managing Director	BARON K. SUMITOMO	.. .. Director
K. OHDAIRA, Esq.	.. Managing Director	K. HORI, Esq.	.. .. „
H. OKAHASHI, Esq.	.. „ „	M. OGURA, Esq.	.. .. „
K. OHSHIMA, Esq.	.. „ „	S. IMAMURA, Esq.	.. .. „
		K. KAGA, Esq.	.. .. „

Home Branches : Osaka, Tokyo, Yokohama, Nagoya, Kyoto, Kobe, Wakayama, Okayama, Onomichi, Niihama, Kure. Hiroshima, Yanai, Shimonoseki, Moji, Kokura, Wakamatsu, Fukuoka, Kurume, Kumamoto.
Offices in Pacific Liners : M. S. "Asama Maru," M. S. "Chichibu Maru," M. S. "Tatsuta Maru."
Foreign Branches : London, New York, San Francisco, Los Angeles, and Shanghai.

Affiliated Banks : The Sumitomo Bank of Hawaii, Honolulu. The Sumitomo Bank of Seattle, Seattle. The Sumitomo Bank of California, Sacramento, Cal.
Bankers : Lloyds Bank, Limited, London. National City Bank of New York, New York. Lloyds and National Provincial Foreign Bank, Limited, Paris.
Correspondents : Established in all important places at home and abroad.

The Bank buys, sells and receives for collection Drafts and Telegraphic Transfers; issues Commercial and Travellers' Letters of Credit available in all important parts of the world, and acts as Trustee for Mortgage Bond, besides doing General Banking Business.

The Bank of Chosen

Capital Subscribed - - - Yen 80,000,000
Capital Paid-up - - - - Yen 50,000,000

Governor: K. Nonaka, Esq.
Deputy-Governor: S. Suzuki, Esq.

Directors:

Y. Katayama, Esq. M. Hashimoto, Esq.
I. Iuchi, Esq. T. Kakiuchi, Esq.

Head Office: SEOUL (Korea)

FOREIGN DEPARTMENT (TOKYO)

(All communications relating to correspondence arrangements and the Bank's general foreign business to be addressed to the Foreign Department)

Branch Offices:

Japan Proper—Tokyo, Osaka, Kobe, Shimonoseki
Korea—Chemulpo, Pyengyang, Fusan, Wonsan, Taiku, Chinnampo, Kunsan, Mokpo, Hoilyong, Chungjin
Manchuria—Antung, Mukden, New Town (Mukden), Dairen, Yingkow (Newchwang), Changchun, Harbin, Tiehling, Liaoyang, Ryojun, Kaiyuan, Chengchiatun, Szupingchieh, Fuchiatien, Kirin, Lungchingtsun
China Proper—Shanghai, Tientsin, Tsingtao, Tsinan
Siberia—Vladivostok, Alexandrofsky Port

NEW YORK AGENCY:

G. Benenson Investing Building, 165 Broadway, New York City

LONDON REPRESENTATIVE:

Palmerston House, 34 Old Broad Street, London, E.C. 2

Correspondents:

San Francisco, Seattle, New York, London, Paris and in Other Commercial Centers throughout the World

Industrial Bank of Japan, Limited

(NIPPON KOGYO GINKO)

Established by the Japanese Government by virtue of a Special Enactment of Imperial Diet

Capital Subscribed - - - Yen 50,000,000

Head Office: 8, 1-chome Marunouchi, Tokyo.
Cables: "Kogin," Tokyo

BRANCHES:

Tokyo: Nihonbashi *Osaka:* Koraibashi
Kobe: Nakamachi *Nagoya:* Minaminagashima-cho
Fukuoka: No. 80 Tenjincho,
Telephone: Fukuoka 1080; 6010

TOYOTARO YUKI, Esq., *President*

DIRECTORS:

Ichimatsu Horai, Esq. Taro Kimimori, Esq.
Koichi Kawakami, Esq. Kotake Shigeru, Esq.

AUDITORS:

Teizo Iwasa, Esq.
Teiichi Soyeda, Esq.
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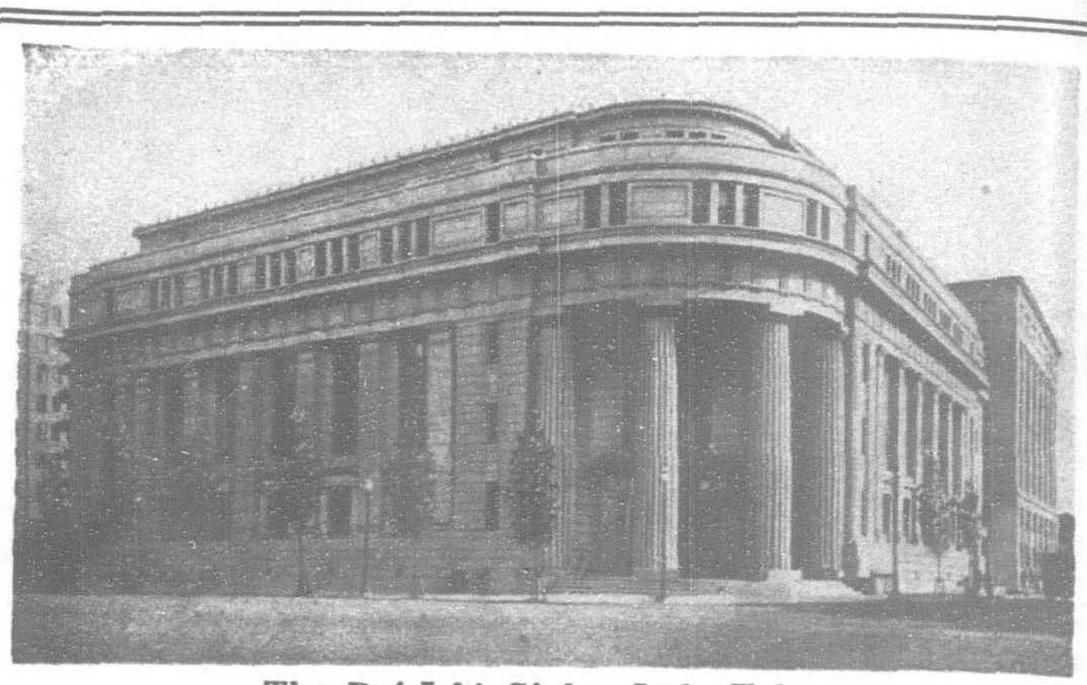
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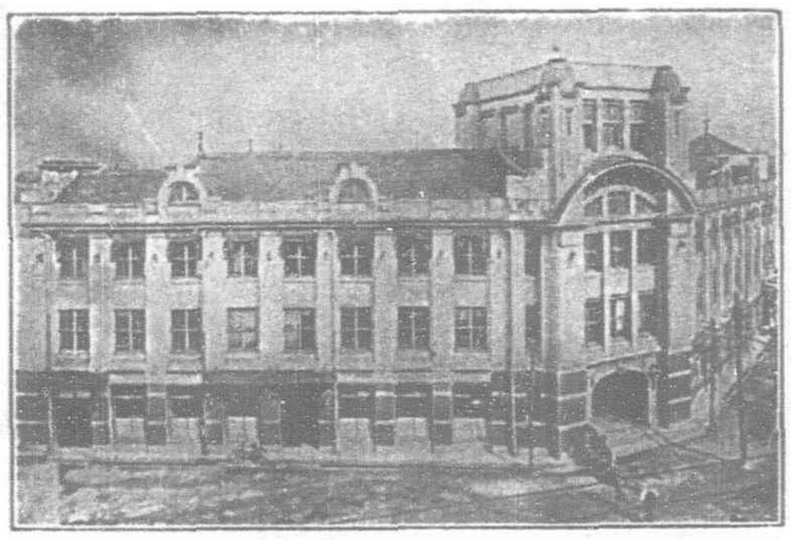
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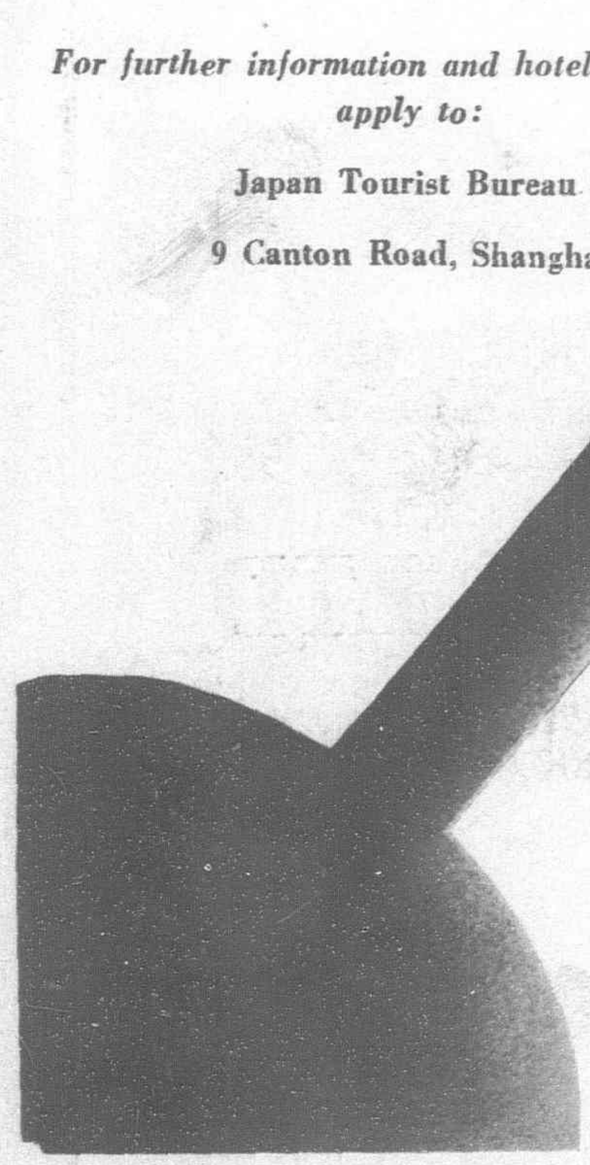
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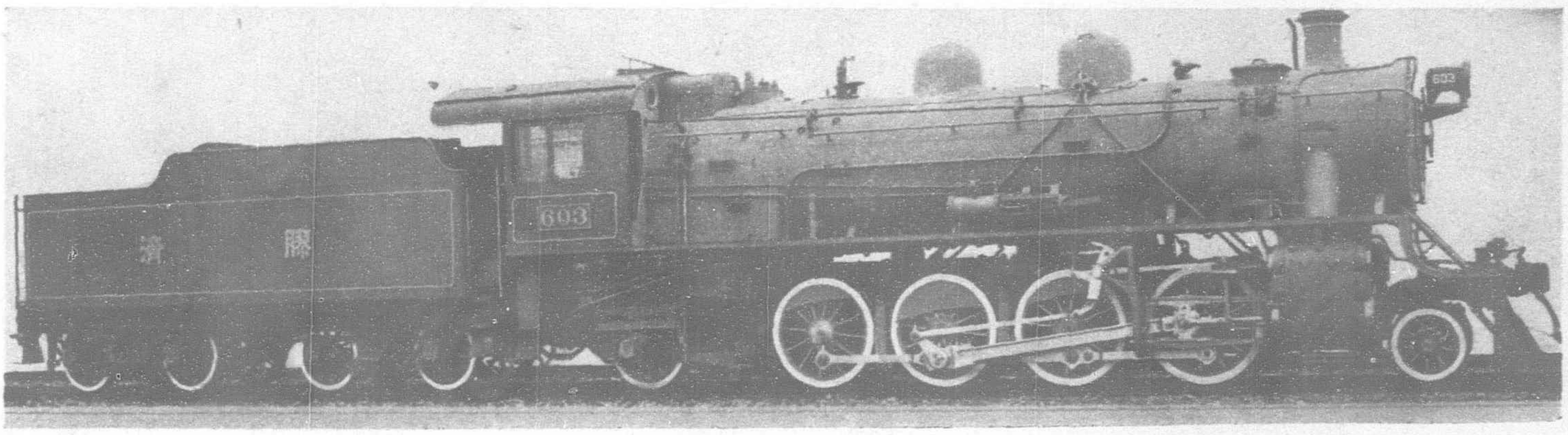
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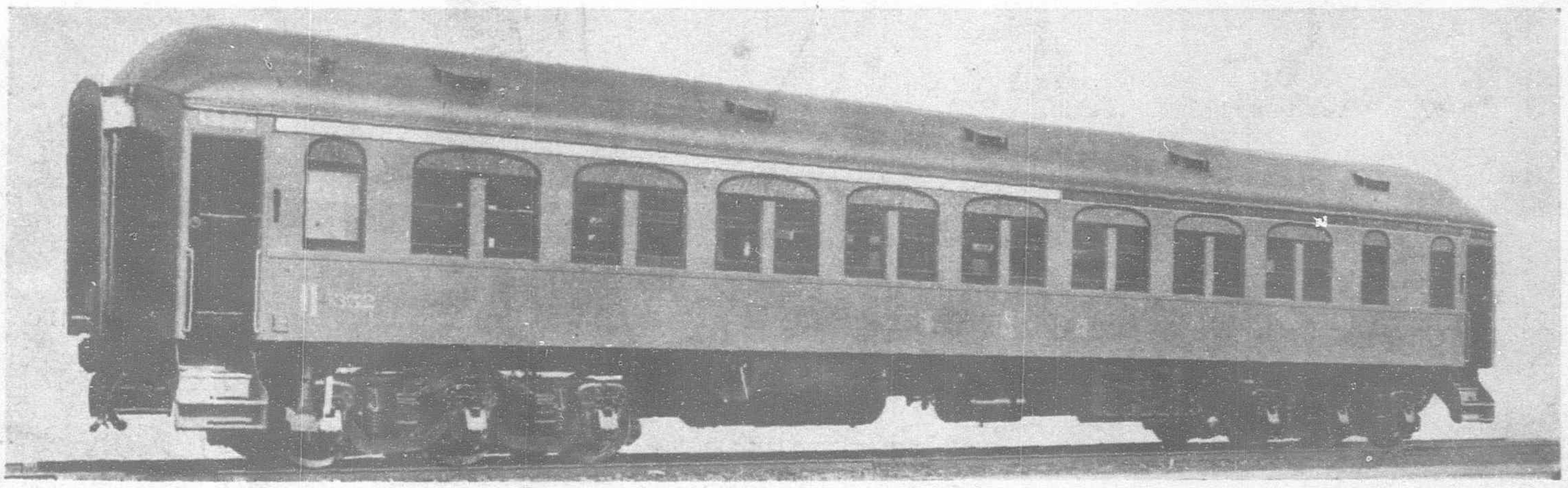
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Two Young Men in China

By C. J. LAVAL

TWENTY-TWO years ago an eight-year-old youth, the tenth and last ruler of the Manchu line, who had been Emperor of China through four troubled years, was dethroned at Peking and a new order came into being in the land, proclaimed to the rest of the world as a Republic. Some fourteen years after this event another ruler who aspired to become an Emperor of China came down out of his dominions in the North and assumed an overlordship in Peking. At that time the young Emperor, who had been forced to abdicate, was lost in oblivion. The northern ruler who wanted to be an emperor was content to bide his time. He took sage counsel from the fate of another dominant figure who eleven years earlier had gone to his death after a brief space of uneasy imperial glory as the ruler of China. Through these times, to the rest of the world, China continued to be held, as it is to-day, a Republic. A Republic, says Webster, "is a state in which the sovereign power resides in the whole body of the people, and is exercised by representatives elected by them." Such a concept is a simple impossibility in China and anyone knows that China did not have at that time and never through all the long course of its history has ever had a government conforming in the least degree with this definition.

Chang Tso-lin, the northern ruler, who had come out of Manchuria and had fastened his grip upon Peking, was an uncommonly astute individual. He guaged the temper of his times accurately. It is probable that this super bandit did not even comprehend the meaning of a republican form of government, for, assuredly, anything of the sort was wholly contrary to all the ideas he had about government. He had entered Peking in all the trappings of a monarch. The streets that he passed over were carpeted with bright yellow sand in strict accordance with all the forms of ancient Imperial tradition in China, but the Manchurian ruler did nothing further to reveal the ambition in his heart. He visualized the situation perfectly and he saw that this so-called Republic of China was dominated by a number of groups and cliques mutually hostile, each under direction of ruthlessly unscrupulous leaders, all greedy for power and wealth, and none of them with a thought for the public welfare. He was probably honest enough to realize that he himself was but one of the many units in the seething political maelstrom and to realize also that the personal aims of the other leaders were his aims as well. He was shrewd enough to know that he could not succeed by hurrying things as Yuan Shih-kai had done in 1915 only to die six months later. Those conflicting group leaders were too much concerned with their own personal interests to accept any scheme of unified rule to which they all would have had to become subordinate. So Chang Tso-lin kept his own counsel, but he saw to it that his bayonets were bright, and he tried to teach his eldest born to be a soldier.

The Youth of Chang Hsueh-liang

This oldest boy of the Manchurian overlord in those days was a husky, smiling, likable youngster. It was in this period when his father was doing all he could to spur the young man's interest in military affairs and in military training that the youth came within the ambit of Chang Tsung-chang, that robust scoundrel, who as Governor of the Province of Shantung perpetrated such a cruelly shameless rule of oppression that the people, bled white and stripped to starvation of their possessions, by thousands forsook their homeland and, contrary to all Chinese tradition, abandoned their ancestral graves in a northward migration that is historic.

Chang Hsueh-liang learned much from this mentor. He learned about women from him, for Chang Tsung-chang usually travelled with a harem of from twenty to thirty sirens of various nationalities chosen as idle fancy dictated and housed in special railway coaches on Chang's many escursions. This human mass of iniquity—for Chang was more than six feet tall and went in bulk to upwards of 300 pounds—began active life as a stevedore on the docks of Vladivostok, and it was in later years when the Russo-Japanese war was being fought in Manchuria that he won the friendship of the old Marshal Chang Tso-lin, who himself was then only a leader of a bandit group. Chang Tsung-chang retained to the end of his life the favor of Chang Tso-lin, a circumstance that never has been understood, for the old Marshal was a stern disciplinarian and the acts and life of this freebooter were such as to shock even the hardiest lawbreaker, and he was held in general opprobrium. This is best attested by the fact that the Shantung youth who assassinated him on the railway station platform at Tsinanfu, freed after a nominal punishment in a land of harsh legal judgments, to-day in north China is regarded as a hero.

This man was one of those who had a part in the early training of Chang Hsueh-liang, who became a drug addict while still a young man, and who is blamed by Chinese public opinion for the loss of Manchuria. The powerful old Marshal, Chang Tso-lin had planned to launch a new dynasty and to make this youth the ruler of Manchuria and of all China. This vast ambition was shattered in the explosion in which Chang Tso-lin was assassinated when the railway coach in which he was traveling on the night of June 4, 1928 was blown to fragments when it was approaching the station at Mukden. The killing of Chang Tso-lin on his own threshold was carried out with a cunning ferocity that left no loophole through which the victim might have escaped, but who planned this crime and who executed it has never been disclosed. It is true that a mass of opinion at outs with Japan for one cause or another say that the Japanese did this thing, but the persons who make the charge never have been able to point out how Japanese interests at that time could have benefitted through the removal of Chang Tso-lin with whom in earlier years the Japanese had had reasonably amicable relations. In the minds of these Japanophobes all evil dwells in Tokyo and when the Yellow river in China runs in flood over a stricken land these persons discover reason to place the blame for the disaster on the Japanese. The reasons behind this assassination have no more been brought to light than have the causes for the assassination at a dinner affair in an official residence in Mukden of Yang Yu-ting, who at the time he was shot was second in power in Manchuria under the Young Marshal, or for the killing at the same time, January 11, 1929, of Chang Ying-huai, the Governor of Heilungkiang.

The burden that was placed upon the shoulders of young Marshal Chang Hsueh-liang when his father died was too heavy. It is to be recorded that all those who have had close contact with Chang Hsueh-liang, particularly foreigners, testify, not only that he is an individual of great personal charm, but that his own

intentions for public welfare were well-conceived and sound. He was beaten by conditions that he could not overcome. It is perhaps true that he did not know the lengths to which abuses had been carried under the rule of his father and of his father's associates in Manchuria. When he succeeded to power he became at once enmeshed in the intricacies of a complex political stituation, the warring elements of which were utterly beyond his control, particularly in his weakened physical state. It is probably not far from fact to conclude that Chang Hsueh-liang was more truly a "puppet" ruler in Manchuria than any it has ever had, and those who held the strings of power were of the same ilk as those his father had encountered in Peking.

Tracing the Causes

The point of difference between the situation at Peking and that in Manchuria was that in Manchuria Japan through the expenditure of the blood of thousands of her sons and millions in treasure held legally acquired rights and interests that are vital to her existence as a nation. If conditions in Manchuria had been permitted to take the course they have followed in China since the abdication of the boy Emperor these Japanese interests would have been destroyed. The outlay in lives and treasure would have been in vain, and the safety of the Japanese nation would have been placed in jeopardy.

Japan prevented this. The luckless Chang Hsueh-liang became the scapegoat of a China he scarcely knows and a new era dawned in the Far East. The dire plight of the exploited people of Manchuria who had been reduced to slavery under the system of the old régime, and the pleas of their few articulate leaders, furnished reason enough to bring into being a new entity in the form of a government independent of China. This is the State of Manchoukuo, presently to be constituted a monarchy.

Chang Hsueh-liang, the deposed ruler of Manchuria, was swept out of official life in China early last year by the tide of popular disapproval that had set in against him. As disfranchised Chinese leaders are wont to do, he went abroad last Spring. Early in January, after an absence of eight months he returned and disembarked at Shanghai. His appearance and his words since his return to China seem to convey the impression that to-day after his travels and his talks with European dignitaries he comes back a somewhat bewildered young man. He says that he wants to work for the welfare of China and there is no reason to doubt his sincerity in this. It is the consensus of opinion that he has contrived to hold on to his money and that he is, in fact, enormously wealthy. For this reason, if for no other, he will continue to be a figure of major importance in the eyes of Chinese politicians, but it seems unlikely that the leaders will burden him with any onerous duties, but will leave him to live the sheltered and closely guarded life that all Chinese must live who possess either power or pelf. Reports about Chang Hsueh-liang that have been published profess a certain degree of interest about the nature of his future activities. This does not appear to be a matter of importance, for the star of Chang Hsueh-liang, if he ever had one, is in eclipse. His story, for the moment is ended. He is just a rich young man without an occupation.

Fate has painted a singular pattern on the life scroll of the boy Emperor who had to abdicate back in 1912. To a marked degree it is like one of those "happy ending" fairy tales, for there is real cause to wonder how His Majesty Hsuan Tung ever survived the experiences that overtook him in the years that he lived in Peking, which in recent times has come to be renamed Peiping. When the Manchu power at length was crushed the interests that organized the new government in China signed a compact on February 11, 1912, with the outgoing Imperial régime. This was known as the Fundamental Law of the Republic of China and was commonly referred to by the Chinese as "The Articles of Favorable Treatment," in which special provision is made for the rights of Manchus, Mongols, Mohammedans and Tibetans, who were considered as being outside the Chinese nation. The clauses in this historic document that apply to the Emperor Hsuan Tung are as follows :

A.—Concerning the Emperor

The Ta Ching Emperor having proclaimed a republican form of government, the Republic of China will accord the following treatment to the Emperor after his resignation and retirement.

Article 1.—After abdication the Emperor may retain his title and shall receive from the Republic of China the respect due to a foreign sovereign.

Article 2.—After abdication the Throne shall receive from the Republic of China an annuity of Taels 4,000,000 until the establishment of a new currency, when the sum shall be $4,000,000.

Article 3.—After abdication the Emperor shall for the present be allowed to reside in the Imperial Palace, but shall later remove to the Eho Park, retaining his bodyguards at the same strength as hitherto.

Article 4.—After abdication the Emperor shall continue to perform the religious ritual at the Imperial Ancestral Temples and Mausolea, which shall be protected by guards provided by the Republic of China.

Article 5.—The Mausoleum of the late Emperor not being completed, the work shall be carried on according to the original plans, and the services in connection with the removal of the remains of the late Emperor to the new Mausoleum shall be carried out as orginally arranged, the expense to be borne by the Republic of China.

Article 6.—All the retinue of the Imperial Household shall be employed as hitherto, but no more eunuchs shall be appointed.

Article 7.—After abdication all the private property of the Emperor shall be respected and protected by the Republic of China.

The Emperor's Boyhood

No single one of the pledges given in the foregoing has ever been kept by those who gave them or by their successors. Every least detail of the compact has been violated flagrantly—an old story, but it bears retelling. The Emperor passed through his boyhood living in close retirement in the period following the abdication. The promised annuity was never paid and this gives some basis for the gossip that filtered out of the palace from time to time that the Imperial entourage was hard put occasionally to find funds to meet necessary expenses. The marriage of the Emperor to the Empress took place in December, 1922, when he was 18 years of age. Through this time he was surrounded by a little loyal group of faithful followers most of whom have followed him through his changing fortunes. And the fates were specially kind to the Emperor Hsuan Tung in these dark days when they gave to him, not only a wise and understanding teacher, but also a staunch-hearted, true friend in the person of his English tutor, who is now Sir Reginald Johnston. A day was drawing near at that time when the Emperor would stand in sore need of every helping hand he could muster, and when the hour of peril came, when the public in China awaited with fearful expectancy the news that the Emperor no longer lived—it was then that his English preceptor surmounted the hazards of a grave and dangerous situation and led his pupil into safety.

Carrying through an act of treachery which brought about the overthrow of the government at Peking to which he owed allegiance, Feng Yu-hsiang marched an army into the capital and took over control of the government in 1924. This marked the opening of a shameful chapter of events. The name of this swaggerer from Shensi, who is a native of Anhwei Province, looms large in the annals of Chinese officialdom, but the whole record of his career fails to reveal a single noble act, nor one kindly deed, but thousands of patient, suffering peasants have gone to their deaths for want of food on the plains of northern China, and these had cause to curse the name of Feng Yu-hsiang and his marauding soldiers who despoiled them and in time of famine carried off their seed grain. In those days they called this man the "Christian General" and at one time sober-minded churchmen in Shanghai organized a great public mass meeting to pray for him ! All China chuckled at that—in the gentle, restrained manner that characterizes the sons of Han when the joke is really good.

When Feng Yu-hsiang went into Peking with his troops he was short of funds and the sources from which they might have been drawn were dried up, exhausted by exactions of preceding administrations. Other causes of political nature contributed to the thing that was done, but the underlying reason was plain greed. It was known that in the palace reposed a great store of treasure, in custody of and the property of the Emperor. The inviolability of these possessions had been guaranteed by "The Articles of

Favorable Treatment," but the covetous militarists of the time regarded this compact as a piece of paper to be torn up.

On a chill November night in 1924 some hundreds of Feng Yu-hsiang's soldiers surrounded the Winter Palace where the Emperor was residing. The officer commanding these troops presented a peremptory demand. He produced a revised draft of "the Articles of Favorable Treatment" and fixed a time limit of a few hours within which he said the Emperor must accede to it. Before the brief period that had been designated had elapsed the Emperor fled from the Palace to the residence of Prince Chun. He has never assented to the revision of the dishonored compact.

When Death was Near

When the authorities learned the whereabouts of the Emperor they transformed this residence into a prison, stationing about it a heavy armed guard which forbade any to enter or to leave. It was at this time that fears for the life of the Emperor spread through the land. It was only after emphatic protests had been made to those in authority by a group of foreign ministers that this menace was removed. The restraints that had been placed about the person of the Emperor were then slightly relaxed and he was permitted to leave Prince Chun's residence for brief airings in an automobile on the footboards of which armed soldiers rode with him. Then it was by a ruse of the Emperor's tutor that the automobile bearing him was inveigled into the Legation Quarter, forbidden territory to armed Chinese soldiers. The Emperor entered a photographer's shop and that was the last that the Chinese authorities at Peking saw of him. He was taken by his tutor first to the German hospital and shortly afterwards a residence was provided for him in the compound of the Japanese Legation. Here he remained for a time, but at length he wearied of the restraints that encompassed him and of the dangers, too, that were ever present. On his own initiative, facing a hopeless future, as he believed then, he determined to flee. It was in a third class railway coach that he took his first train ride, posing as a student by the name of Wang and traveling with a single companion. His disappearance from the Japanese Legation compound was at once discovered and his movements were traced with the result that when he completed the short rail journey from Peking to Tientsin a group of Japanese dignitaries was on the station platform at Tientsin to greet him. He acquired a residence in the Japanese Concession in Tientsin and with the Empress and the members of his retinue, who had followed him from Peking, he remained living in quiet retirement in Tientsin for the next six years.

After the incident in the Fall of 1931 when Japanese forces drove the troops of Chang Hsueh-liang out of Manchuria a wholly new vista was opened before the eyes of the Emperor Hsuan Tung. Through the period after his abdication he had lived under his personal name, Henry Pu Yi, and it was as Mr. Henry Pu Yi that he was urged by his own followers and by advisors to accept the position of Chief Executive of the newly-formed Government of Manchoukuo in the homeland of his Manchu forbears. He assented to this and in published interviews, the authenticity of which may not be questioned, he has denied as absurd rumors that were set in motion in Chinese circles that he had been kidnapped by Japanese when he went to Manchuria from Tientsin.

Although he has never surrendered his title of Emperor, it was as Mr. Pu Yi that he assumed place as Chief Executive of Manchoukuo when that Government was founded on March 1, 1932. The approaching second anniversary of that momentous event is to be made notable in Manchuria, for in January the official announcement went forth that on the anniversary date of March 1, 1934, Chief Executive Henry Pu Yi will be enthroned and crowned Emperor of that vast northern territory whose area is greater than the combined areas of France and Germany.

What the Future Holds

If peace is maintained, the Occidental world in coming years will witness an extraordinary international competition played out on the vast stage of Asia, and onlookers may be enabled to measure the gains and losses in China against those of the new Empire of Manchoukuo. It may be a bitter contest, for the principals both possess advantages and are hampered by drawbacks peculiar to each in the two domains. It is too early to make forecasts, but present-day conditions in the two areas may be studied to advantage.

In the report of the Lytton Commission of Enquiry to the League of Nations it was held that the rehabilitation of China can only be effected through foreign co-operation. It is admitted that peace, order and prosperity can only be brought about in China by providing the country with adequate railway communications. Therefore the only avenue along which foreign co-operation can travel to bring about the rehabilitation of China is to provide the cash funds for the railways that are a primary essential. A system of communications of the magnitude required, it is estimated, would run in cost to Gold $500,000,000. Assuredly no single power and no group of powers will furnish any part of this vast sum. The League cannot help, for its credit in matters of this kind is at a low ebb, Geneva to-day being at a loss to do anything about the so-called "League loans" running to a total of $400,000,000 that are now years in arrears. Can China help herself in the emergency? China remains essentially an agricultural nation with her real wealth in the land, for the progress that has been made thus far in the industralization of the country is insignificant. The great bulk of the population of China—360,000,000 people, it is estimated—live on the land which is the main source of the resources of the nation. But rural China is bankrupt and in chaos, says a prominent Chinese writer, Mr. Yao Hsin-nung. He paints the situation in dark colors and in an article lately published in the *North-China Daily News* of Shanghai he says,

> "Of all the vital issues of distressed China to-day, the one of first importance and urgency is the rural problem. For thousands of years rural China has been the pillar of the nation's economic structure. Its downfall implies, therefore, the ruin of the entire country. In normal times, the Chinese peasants, toiling throughout the year, mutely and contentedly feed the nation. But in the past twenty-two years of the Republic, they have suffered time and again devastation of natural calamities and impoverishment of man-made disasters, till they find themselves to-day no longer able to bear, as their fathers did, the growing national economic burden.
>
> "They cry for help but their feeble voices are drowned completely in the deafening clamor of factional disputes and resultant civil wars. The return from their yearly toil, pouring into the Government treasury and the war-lords' purses, only brings back more torture instead of relief. Forlorn and desperate, they desert their farms, turn into bandits or Communists. This makes the situation worse and affords the militarists additional excuses for their gladiatorial adventures.
>
> "The cumulative evils and misfortunes of all these years have reached the point of volcanic eruption that threatens to make a Pompeii of China."

The Other Viewpoint

Now turn to a picture of things in the infant State of Manchoukuo approaching its second birthday. In the course of an article in *The New York Times*, which appears in this issue, Mr. Hallett Abend, Special Correspondent for the newspaper in the Far East, says:

> "Even the most harsh critics of Japanese policy must admit that Manchuria to-day is better off and better governed than it has ever been.
>
> "Although Chinese propagandists continue to tell the world that the 30,000,000 Chinese living in Manchuria are being oppressed, this charge cannot be substantiated. They have a Government imposed upon them, but it is equally true that this Government is infinitely more efficient, less corrupt and more concerned about the welfare of the people of Manchuria than were its predecessors.
>
> "The fact that conditions in Manchuria are to-day incomparably better than those existing in China proper is evidenced by the fact that during the first seven months of 1933, 211,200 Chinese immigrants entered Manchoukuo through the Port of Dairen and many other thousands entered through Newchwang, Antung and Hulutao. For the first time in Manchuria's history a Government exists there which is attempting to handle the immigrants and the unemployment problem through an efficient government organ.

"Many innovations are being made which testify to the stability and widening authority of the new Government. Provincial, county and village peace preservation committees are being entrusted with the maintenance of law and order in their own areas, and the difficulties of banditry are more than doubled by the efforts being made to equip all towns and villages with field wireless sets so that help may be quickly summoned."

The main obstacles that stand in the way of China's future progress are the state of affairs within the country—involving civil strife, banditry, communism and an impoverished populace—and lack of resources in the face of huge indebtedness within and without the country. The major drawbacks that handicap Manchoukuo include the threat of war, a falling market for her products, banditry and her isolation as an unrecognized state with the need of overcoming an unfavorable opinion that a portion of the outside world holds.

In line with the recommendation of the Lytton Report to provide foreign co-operation for China's betterment the League has been sending and is continuing to send into China a galaxy of experts and advisors of every degree. This, plus a measure of sympathy, seems to be China's one resource to meet a situation, the only remedy for which appears to be an outpouring of huge sums of money.

With reference to the highly paid experts and advisors from the League it is quaintly significant that in this connection China is contriving to pay a double charge with a single outlay, for the money expended by the League for these experts is drawn from the annual cash payments of Gold Francs 400,000 that China has agreed to make toward liquidation of the debt of Gold Francs 9,000,000 that she owes to the League for back dues that are long in arrears. China began paying up on condition that the money would be expended by the League in China, and the League accepted this condition. China, therefore, in the situation that confronts her has the asset of the advice of the League counsellors to the extent, at least, of Gold Francs 400,000 yearly.

The major resources of the rival to China that has arisen in the north include a stabilized currency, reduced taxation and tariff, an improved purchasing power of the people, a degree of ability to borrow, a feverish determination to succeed and—Japanese bayonets.

It is a battle of youth against age and in an unfeeling cynical world there's a tradition about that.

Responsibility for Peace and War in the Pacific

By Dr. H. F. ANGUS, University of Columbia, B.C.

(*The following is the text of an address delivered by Dr. Angus in October at the Vancouver Institute.*)

I WANT to speak very frankly, and I am going to begin by stating a few general ideas that form the background of my view of international relations. No people, I think, wants war as such. Wars are not arranged like football matches in America, or student duels in Germany. But no people wants peace so much as to be prepared to sacrifice all other considerations in order to maintain it. A people which did would be generally despised. This fact is widely recognized. The phrase "too proud to fight" has never been a success. Covenants to renounce war contain an implicit exception for the case of self-defense. This exception can be widened so as to make the covenant meaningless if we go on to say that self-defense means the defense of any interest which we choose to consider vital.

Even without this cynical display of logic we must, I think, make self-defense include self-preservation. It is possible, of course, to believe that no nation will ever be obliged to fight in self-defense unless some other nation has been unduly aggressive; and to believe that no nation will ever be obliged to fight for self-preservation.

Fallacious Beliefs

But even if these beliefs are justified (which I doubt) it seems to me foolish to derive much comfort from them. To prove that war is unlikely one would have to hold much more daring beliefs—one would have to think that no nation can ever be persuaded that its safety is endangered by the act of another, that no nation can ever be persuaded that some act is necessary for its welfare, which will appear unduly aggressive to another, that no nation can be led to think that its self-preservation requires the use of force. I do not hold these beliefs. I do think, as I have explained, that discussion can do a great deal to prevent misunderstandings, but I am not prepared to back discussion as a winner in a short distance event against the massive emotional propaganda with which at times it is forced to compete.

There is a second sort of optimism which I must repudiate. It is usual to point to the fact that private warfare—of which duelling is taken as the example—has been eliminated, and to argue that it is not difficult to apply the same methods of elimination to warfare between nations, so that resort to the courts will replace resort to the battlefield. This reasoning is, I think, fallacious. The fallacy lies in generalizing from a single example. Duelling is private warfare for a matter of honor. It has disappeared. So perhaps may international warfare for matters of honor, though I am not sure that many people were not happier to think that they were fighting for a scrap of paper than to think that they were fighting for material objectives. To kill for gain seems sordid!

Private Warfare

But there is such a thing as private warfare for material interests, and where it has been suppressed, the suppression has not been entirely through the use of the courts. What happens when, within the limits of a single state, some group or class has felt itself oppressed? (The reason may be, for instance, that some other group controls the bulk of the land or the bulk of the capital and makes an unreasonable charge for its use). More and more urgently the aggrieved group presents its demands. It does not take them to the courts, for the courts would invariably protect the recognized legal rights of the possessing groups. The demands are presented not to courts but to legislatures. What is demanded is not the enforcement of existing rights but the creation of new rights. These new rights will benefit one group by curtailing the existing rights of other groups.

If the legislative process works with reasonable efficiency there is no question of resort to private warfare. If the legislature is unresponsive, there may be minor outbreaks which are repressed. If it never acts there may be revolution. It is not duelling but revolt or revolution within a country which is the counterpart of war. Civil war is the counterpart of international war. But it is less frequent because there is the possibility of meeting new situations by peaceful legislative changes.

This method has no international counterpart. The method which has minimized—though it has not eliminated—civil warfare, has not yet been applied to international warfare. It could be applied only by the creation of an international legislature which could speak the language of command to states hitherto obedient to no command. In geological time the establishment of such a superstate may be "just around the corner." In historical time it is probably several centuries away. These are conjectures. The certainty is that a superstate is not an immediate possibility.

It is with these general ideas of mine before us that I wish to turn to the central fact of the Pacific Area:—the economic situation of Japan.

In the last 50 years Japan has westernized her economic life and has profoundly altered her cultural life as well. The advance has taken place with a speed that is almost incredible. And Japan has appeared to be on the threshold of prosperity, in the western sense of that word. In a peaceful and (we must add) a reasonable world, there lies a most promising economic future before Japan.

But even if we were to assume that the world is peaceful, the most rashly optimistic would hardly venture to call it reasonable. And Japan's economic future is beset with dangers which must be a source of incessant anxiety to her leaders.

The population of Japan which had been practically stationary for the two centuries of the Tokugawa Shogunate began to increase

rapidly as Japan "westernized." There was nothing surprising in this phenomenon. It had occurred in all countries which had passed through the process of industrialization. The birthrate in Japan, for instance, never rose as high as the English birthrate of the middle of the 19th century.

And the fertility of Japanese marriages has begun to recede exactly as has happened in other countries. If, for the time being, the rate of increase has remained high, it is because the rapid expansion of the population has left the proportion of women of child-bearing age much higher than in countries with a stationary population. In this the condition will correct itself and it can be predicted with reasonable certainly that the population of Japan will eventually become stationary. This sober calculation is one of the contributions of research to the discussions of the Institute of Pacific Relations.

But the sober calculation which banishes exaggerated fears nevertheless discloses a dangerous situation. The present population of 65,000,000 may be expected to increase to 90,000,000. As numbers become stationary the proportion of children will decrease and the proportion of the population for whom work must be found will increase. The employment problem will become more difficult.

What is to happen to this growing population ? The increasing numbers who will have to enter economic life during the next 15 years are already born. There is nothing problematical about their existence. Birth control clinics cannot reduce their numbers. Only disease or famine or murder could do so.

It does not seem likely that great numbers can derive their living from agriculture and allied occupations. Indeed it is probable that the numbers already on the land are excessive, and that their per capital income would be higher if they were smaller. The average area per laborer is from our western standpoint incredibly low. The production per acre is almost incredibly high. There is little or no room for expansion. New methods may make new areas cultivable but these areas are not likely to support a large population.

It seems probable that the agricultural classes would already have met with disaster but for the rapid progress of silk-raising as a subsidiary industry. The profits from this occupation, with its immense labor re-requirements, have offset the uneconomical subdivision of the land. Of the importance of silk in Japan's foreign trade I shall speak in a few minutes. In this respect it might conceivably be replaced by rayon. But as an item in the farmer's budget it is harder to replace.

The future of the silk industry depends on American women continuing to prefer silk to other textiles, including rayon. Should a cautious Japanese economist say with the experienced Francois 1st: "Souvent femme varie, fol is qui suy fie." For on the future of silk industry depends the future of the Japanese farmer. Almost literally he is hanging by a thread—a silken thread. An expansion of this industry seems very improbable. Rayon competition has already been mentioned. There is also the possibility of Chinese competition in silk production ; the possibility of changes of taste among consumers.

If, then, occupations are to be found for the increasing population, it is to industry that Japan must turn. One hundred years ago England was able to meet her population problem by emigration (which is out of the question for Japan) and by industrialization, England did not have to press the cultivation of her land beyond the point of diminishing returns. In a peaceful and reasonable world industrialization would be very easy.

Japan would be a large buyer of raw materials, particularly of iron and coal, and an exporter of highly finished manufactured goods. She would become rich and so would the landlord countries which sold her raw materials and footstuffs. There are many countries ready and willing to supply these things. Canada, Australia, India, Russia and any others. There is no danger of a shortage. Physically the increase in Japanese population need not be an economic danger either to Japan or to other countries.

However, there are difficulties which are not physical. The countries ready to sell meat and milk, wheat and wool, iron and coal, want to be paid and they think of money payment. But Japan is not a great producer of gold. If Japan is to pay in money she must obtain the money by selling her exports. It is the old story of goods and services with which war debt discussions have made us familiar. What goods and services does Japan sell ? Her principal export is raw silk to the United States. This constitutes 40 per cent of her export trade. It is not likely to expand. It is at the mercy of the American tariff, and at the mercy of the caprice of American women.

The next export in order of importance is a manufacture—cotton. The chief market is China. This export therefore is vulnerable to a Chinese boycott, or to a Chinese protective tariff. Other markets: Malaya, India, Africa are equally vulnerable. Countries wishing to take the first step in industrialization usually begin with a tariff on cotton yarn and coarse cotton. Within the British Empire a preferential tariff for the benefit of Great Britain is common. Other manufactures might develop—as for instance, rayon has developed. They are exposed to similar dangers.

Japan's economic peril is that she may be compelled by her growing population to become industrial and to rely on foreign countries for food and raw materials while at the same time the protective policies of these countries prevent Japan from acquiring the money with which to pay for the food and raw materials. Quite simply the same sort of policy which has made it impossible for the United States to collect war debts might cause the economic destruction of Japan. A tariff blockade might strangle Japan as a naval blockade strangled Germany 15 years ago.

Remember that a nation's tariff has hitherto been thought of as its own business. To raise a tariff is not a hostile act. Japan could not appeal to an international court for redress. She would be told that other nations were only doing what they were perfectly entitled to do. Courts, we have seen, protect established rights. There is no international legislature to which she can appeal. Her only appeal is to bargaining. She can say to Australia, "I can buy your wool but only if you will buy my silk or my pottery." For bargaining, Japan is less well placed than England who buys more than she sells. Or Japan can cut her prices either directly or by depreciating her currency, as indeed she has already done. But in this case tariff retaliation is the probable outcome.

It is worth emphasizing that this need of Japan for markets if she is to obtain the money—or the foreign exchange—with which to pay for essential imports is quite different in character from the desire of capitalist countries in general for markets which will enable them to dispose of a surplus production, for which consumers cannot be found at home, and so to enlarge the scale of their productive industries. Japan's need for iron and coal is a basic need which exists independently of whether the economic system of Japan is capitalistic or communistic. It follows that Japan's need for foreign markets in which she can obtain the means of paying for her imports is also a basic need independent of Japan's economic system.

Indeed we find the same need of selling something in order to obtain the wherewithal to pay for essential imports in the case of the U.S.S.R. as we realize to our sorrow when Russia sells timber or wheat. Japan, too, is forced to sell on disadvantageous terms, but the goods which she offers on the markets of the world are silk and manufactured products. The manufactured products are things which other countries can make for themselves if they choose.

Now put yourself in imagination in the position of Japanese statesmen. What are you going to do to ensure the economic future of your country ? How are you going to "Blast your way into the markets of the world ?" Other countries have acquired political control of the land they need, and of the sources of raw material essential to their well-being. But they were at liberty to use methods which are now forbidden. Is it worth asking whether they feel under any obligation to share the spoils with the newcomer, now that they have forbidden the newcomer to help himself ? To ask the question would be to court a humiliating reply and a reputation for aggressiveness.

Is it safe to rely on some countries at least being willing to trade on reasonable terms ? If not Australia, then Canada or Russia ? Or is the safest course to make the most of the rights acquired before the closed season was introduced—the rights in Manchuria. At least if these rights are in danger is it not a matter of self-preservation to maintain them ?

Of Manchuria I shall speak very briefly, for you are well acquainted with what has taken place. Given security and economic freedom, political control is in no way necessary for Japan. And the good-will of China is important to Japan because of trade with China. The solution of the Lytton report is to recognize and in a measure guarantee what are considered Japan's legitimate interests and to insist on measures tending toward the economic restoration of China. China is prepared to accept these terms. Why should not Japan do so, too ?

The answer seems to be that Japan has committed herself to the recognition of the new state and, roughly speaking, to a policy of self-help. As regards her obligations as a member of the League of Nations she has acted quite wrongly.

But I do not think that we should make too much of Japan's having repudiated a treaty obligation, or at least having insisted on interpreting her obligations in her own way. In effect Japan has introduced into the covenant renouncing war an exception for an act of self-preservation, and has made herself sole judge of whether a case of self-preservation exists. We live at a time when governments are being constantly urged to repudiate their agreements in the supposed interests of expediency.

Governments are urged, for instance, to repudiate their bonded debts, or to reduce the rate of interest by a unilateral act, or to give priority to their expenditures, e.g. " babies before bonds," in the phrase of the Australian politician. And salaries, which are contractual, have on occasion been reduced by unilateral action. These acts, indefensible on rigid standards of honesty, find their alleged justification not in self-preservation but in expediency.

Only those of you who have never listened with sympathy to such arguments are entitled to condemn Japan for acting illegally.

It is, however, quite possible to hold that Japan acted not only illegally, but also unwisely. This is the view of many foreign critics and, I am inclined to think, of many Japanese liberals. With an important reservation it is my own opinion. The reservation is this, " What Japan did may have been politically invitable." For instance, it is possible to believe that the American N.R.A. is a most unwise measure and yet to say that the federal government was wise in choosing it as the least of the possible evils, given the state of public opinion and the temper of Congress. That is, to believe that while America, as a whole was foolish, the government was wise. The same sort of reasoning may be applied to Japan. We may hold that the Japanese nation has been foolish and yet think the government wise.

It was very natural for a party of action to arise in Japan, for liberal statesmen to be thrust into the background, and for the army rather than the politician to command the support of the rural population. All this does not amount to more or less than saying that Japan's action was politically unavoidable in the sense in which the refusal of the United States to enter the League of Nations or to accept a settlement of war debts is politically unavoidable. Many Americans who deplore these things are quick to explain their political necessity.

The result of all this is to create a situation of a most deplorable character. Any attempt to coerce Japan, e.g., by an international boycott which would cut off her markets for silk and cotton and rapidly impoverish the country, would be quite likely to provoke a blind passionate war of self-preservation and yet a war leading to self-destruction, a war which the West would win, no doubt, but to what purpose ?

The West would have vindicated its right to refuse to trade with Japan—a right of non-intercourse which ironically enough the West has, in the past, fought to prevent Japan or China from exercising. With what heart would you be ready to fight in such a war or send your sons to fight ? Even if, with all the power of mass psychology, it was represented as a war to preserve the League of Nations and the Peace Treaties—as a war to end war. In the West it might, honestly enough, be thought of as a war for these purposes. And yet it would be bad because it would be a bad way of accomplishing these purposes. For there is a better way and a safer way, if it is politically possible in western countries.

But the course which I am sorry to say I think is most likely to be followed is to let China suffer heavily for the fear which the economic policy of the western countries has aroused in Japan, and at the same time to abuse Japan as the villain of the piece. Only the excuse of ignorance can save such a course from the reproach of cynical hypocrisy. This excuse of ignorance is open to peoples—it is not open to statesmen. It was open to some of you yesterday but—if I have made my case—it will be open to none of you to-morrow. You may think I have overstated my case, but before you condemn me, you will be bound to look up the facts and figures for yourselves.

I have suggested that there is another course which is theoretically possible, which is sound and honorable, which is full of promise and hope for the future, but which may be beyond the bounds of political possibility. Let me indicate briefly what it is.

The nations of the world might agree to " economic disarmament " and might voluntarily recognize some mutual duties in the matter of tariffs. They might well recognize that their insistence on the control of immigration carries with it the obligation to allow, and even facilitate, the trade necessary for the existence in their homeland of the populations which are excluded. This recognition might well be coupled with a condition that the goods exported in payment should be produced under living conditions and at rates of wages which would steadily approach those of the western countries.

Measures of this character would create a new world order based on voluntary co-operation for the mutual advantage of sovereign states, with the understanding that the claims of the states poor in natural resources would receive appropriate consideration. I realize—and I want you to realize—that what I am suggesting is nothing less than philosophical anarchy or " mutual aid " in international relations, and that men and women being what they are, the idea may be hopelessly utopian.

So long as we, in the West, leave this policy unattempted and this offer unmade, I do not think that we are in a position to condemn Japan without in some measure condemning ourselves as well. And yet we must face the fact that such an offer, while in no degree unreasonable, would be politically very difficult to make. To carry it out would quite definitely injure a number of protected interests in the countries which undertook it, for some of our industries would be replaced by Japanese industries.

It is true that, nationally speaking, this loss might be more than offset by expansion in some of our export industries. But the loss of employment would be more visible than the gain of employment. And the loss to invested capital would be more conspicuous than the gain to other industries. Nor would it be easy to arrange for compensation. Politically speaking, opposition is much more likely to succeed than a novel proposal, however reasonable in itself.

Let me illustrate this point from two examples near home. To give the vote in British Columbia to the small number of men and women of Oriental race born in this country would be a courteous and conciliatory act as regards our great neighbors across the Pacific. From a domestic standpoint it would be a mere act of sanity. An unenfranchised population is bound to become discontented and embittered. We must aim at making our country one in which the descendants of the present population can live in peace and friendship. To terminate the abuse of taxation without representation might rank as a liberal principle, and to champion the cause of inter-racial and international friendship can hardly be at variance with the policy of the Co-operative Commonwealth Federation.

But I have seen no statement by any candidate for the legislature advocating this reform which would do no more than bring Canada in this matter to the same level as the United States. We must not think of the right to vote as futile distinction, for in the last few days a minister of the Crown has made the suggestion that employers of labor should replace Asiatic labor by white labor and so throw the burden of unemployment on the Asiatics. No minister, so far as I have seen, has dissented from this proposal. One doubts if it would have been made on the eve of an election if Asiatics had been on the voters' list.

The other example concerns a matter of federal competence. We continue to maintain a separate immigration for one single race and to impose peculiar disabilities on the Chinese alone. To put them in the same position as the Japanese and to bring them under our general immigration act without insulting discrimination would involve nothing or little more than admitting merchants and tourists and allowing 75 wives and children of Chinese men resident in Canada to enter the country each year. But this action is " politically impossible."

I have preferred to take examples from our own country as a beginning and to select examples not directly related to the mentality of capitalistic system. My thesis this evening is that the responsibility for the maintenance of peace and the avoidance of war is not satisfied by signing treaties of arbitration and of renunciation of war, but that it requires a persistent will to peace, whose symptoms lie in a steady avoidance of acts or policies either offensive in form or wantonly injurious in content. But this is anticipating. I wish next to turn to a contemporary development of very great significance.

Within each nation there are conflicts of economic interest as real, as severe, and often as bitter as any international economic conflict. But each nation is politically organized for the settlement of these conflicts. It has its constitution, its government, its legislature. It is able to make adjustments and only on rare occasions do conflicts of economic interest lead to civil war or to revolution. Usually they are settled peacefully, although they may be settled unjustly or even cruelly.

Thus the Australian sheep-raiser has been forced by a tariff to subsidize the industrial community; French industries have been forced to subsidize the cultivation of wheat; the urban population of New Zealand has been forced by deliberate exchange depreciation to pay what amounts to a bounty on exports of butter and mutton; the South African negro has to submit to a color bar; the Australian sugar grower receives an enormous bounty; the American merchant marine is subsidized .... This list is interminable. A recent example of an internal adjustment undertaken on a large scale with little regard for its international repercussions is the American N.R.A.

Indeed, the settlement of these internal differences frequently produces or intensifies the international rivalries which appear at times as a menace to peaceful international relations. Examples: Thus the Japanese buyer of Australian wool cannot pay with Japanese manufactures; we cannot pay for French wine with Canadian wheat; Denmark had to depreciate her currency in order to compete with New Zealand butter; and so on. When international economic conflicts develop, there is no legislature to which they can be taken for adjustment. Nations whose vital interests are imperilled can obtain no relief which involves any interference with the sovereign rights of other nations. The strain which is thus placed on international goodwill may be intolerable. And if a crash occurs, there is a sense in which those nations whose domestic policies have led to the tension are responsible for the wars that may ensue, even though they themselves may not be directly involved.

The reason for conduct which appears inconsiderate and on occasion brutally reckless is not hard to find. We have taken examples from many countries. We might have taken them from almost any country. For in democratic countries governments are chosen, in undemocratic governments are tolerated, precisely because of their ability to deal with internal economic conflicts. Access to office and tenure of office depend on this test. It matters little enough whether the economic conflicts have been settled by making the international situation worse. There is no use in complaining about this state of affairs. There is no chance of its being otherwise.

What political leader do you know who would not consider it a perfect answer to a demand for conciliatory international action if he could say: "What you ask is reasonable. I, personally, should like to do what you ask. A few people like yourself want it very strongly. Perhaps more than half of the electorate would approve, though it is not important to them. But there is a well organized minority which *is* strongly opposed and the plain fact is that I could not expect to remain in office if I did what you ask." He would hardly think it necessary to add, "And therefore I refuse." I think that a man who spoke in this way would be classed as frank and straightforward rather than as cowardly and venal.

It is by such paths as this that we come to the fatal doctrine that each nation should import only those things which it cannot make for itself, except at an outrageous cost. For such a doctrine, expensive as its application may be, does seem to make for internal harmony. But it is none the less a fatal doctrine. Consider the position of a country which must import things which it cannot produce itself and which can offer in payment only things which its neighbors can produce if they wish. If its neighbors refuse to buy what they themselves can produce, such a country is blockaded. It may be able to drive a bargain with countries anxious to sell, but its bargaining power is not great. The example of England is misleading, for England as a creditor nation can buy far more than she sells and can refuse to buy from countries which exclude her exports. Japan has not this favorable position. And an attempt to bargain may appear like an attempt to intimidate.

Now if enlightened and conscientious national governments are improbable for the reasons which I have explained, and international government is impossible, the future (or the immediate future) holds nothing better in store for us than a series of make-shifts and palliatives. And it may hold far worse things in store. This unpleasant conclusion was in our minds at the close of the Banff Conference. Some delegates were—I thought rather naively—annoyed that we had reached so negative a result. They complained that "no constructive suggestions had been made," that "we were brought up against a stone wall," that "we had not got anywhere."

Why anyone imbued with a scientific spirit should wish to "get anywhere," I do not know. He should wish to get knowledge, or failing that, a probability. This we had done. Besides, to have come up against a stone wall is to have got somewhere, albeit to a bad spot. If one is in such a spot —there are four courses open: (1) one can stay there and bemoan one's fate; (2) one can try to climb over the wall; (3) one can try to get round the end; (4) or one can try to blow it up. Metaphorically speaking all these courses were open to us; just as they were open to you.

To try to climb the wall is to try to improve the quality of national governments until international co-operation is practicable. There is no harm in trying to do this. To go round corresponds to trying to constitute an international government. We can try if we like. To blow up the wall is revolutionary—to succeed you must have the explosives and there is some danger of being hurt in the process. To wait for something to happen is a confession of powerlessness. But if one is powerless why not admit as we do when in the natural sciences we reach the limit of our powers.

I have dealt with basic situations, and basic causes of war. I have done this because I believe that it is at this point that action must be taken if it is to be effective. I know that a great deal has been written about the danger of armaments and the dangers of war psychology. But armaments and war psychology do not arise of themselves nor are they entirely the creations of business men who want a market for munitions.

Men who see a danger and little hope of avoiding it, are impelled by the most conscientious of motives to vote for armaments. Soldiers who are responsible for the action to be taken if an emergency occurs would be doing less than their duty if they did not make their plans for every contingency and press for adequate personnel and equipment. And when these claims have to be brought home to taxpayers far more strenuous propaganda is required than is needed when the demand is for schools or old age pensions. The taxpayers have to be frightened. It is as bad as if no money could be had for a university without representing it as a bulwark against revolution and then representing that revolution was imminent.

The atmosphere of alarm needed to get money, or of boasting needed to maintain morale is of course in itself a great danger and from it may well arise the incident which is the immediate cause of conflict. Americans from Hawaii, Japanese and Chinese tell us of the war psychology. Something of it we can see from the Hearst papers. But to concentrate on this war psychology or on armaments as a basic cause of war is sensible only if they have continued to exist with no real justification for them remains.

Famine and poverty are tolerable things, so long as their causes are seen to be inevitable, to lie in drought or flood or want of capital. They become intolerable things when it is seen—or believed—that they could be avoided if men and women could organize their lives in a co-operative way. To say that we have not yet succeeded in creating an organization of this sort and that under present conditions it is psychologically impossible to create one is true, but it is truth which infuriates the sufferers, who instinctively if uncritically refuse to believe it.

It is much the same with war. War is bearable if it appears as a struggle for self-preservation. It may even give an inspiring feeling of co-operation for a common objective which makes wholehearted co-operation psychologically possible. But war is intolerable if it is seen (or believed) to be avoidable and if the same or better results can be reached by agreement.

Now, supposing the answer is that sensible agreements can readily be imagined but they are politically impossible, what effect will that answer have? The majority will refuse to believe it. They will insist that their governments come to agreement. But they will not relieve their governments of the political pressure which makes agreement impossible. The result is seen in make-believe agreements—in formal agreements to refrain from war without the steady mutual aid necessary to maintain peace, and as in the past we shall have the appearance of safety with no real diminution of the danger.

The Situation in Manchoukuo

By HALLETT ABEND in the "New York Times"

With the second anniversary of the so-called "Mukden Incident," which on September 18, 1931, marked the beginning of Japan's action in Manchuria, even the most harsh critics of Japanese policy must admit that Manchuria to-day is better off and better governed than it has ever been. To use a military phrase, for two years Japan has been fighting hard on three fronts, and on two of them has achieved notable victories.

On the first of these—that is the bandit-suppression front—actual military action has been almost unceasing.

On the second front there has been the battle against the utter disorganization created by Japan's own intervention. Here she has achieved what seem like miracles in rebuilding a government from the ground up, and simultaneously rebuilding the shattered business and economic structure of the country.

On the third front, where she has battled to overcome the criticism and hostility of opinion abroad, the fight seems to be almost a stalemate.

Much blood has been spilled and many promises have been broken since the last weeks of September, 1931. At that time the Japanese Foreign Office was assuring the world that there would be no extension of a "local incident" and that Japanese troops would not go outside the South Manchuria Railway zone.

Three months later Geneva was assured that the Japanese had no intention of capturing Chinchow. Later there came definite disavowals of any intention to make an incursion northward to Harbin or into the Chinese Eastern Railway zone.

And yet the pressure of events forced a continual expansion of the zones of activity and occupation until to-day all of Manchuria including Jehol have been occupied and Japan finds herself bound by a solemn protocol to maintain the new government of Manchoukuo.

Although Chinese propagandists continue to tell the world that the 30,000,000 Chinese living in Manchuria are being oppressed, this charge cannot be substantiated. They have had a government imposed upon them, but it is equally true that this government is infinitely more efficient, less corrupt, and more concerned about the welfare of the people of Manchuria than were its predecessors.

The heaviest burden which has been lifted from the shoulders of the peasants of Manchuria has been the former necessity of supporting a mercenary army of 300,000 men. To-day the armed forces of the government of Manchoukuo total 108,264 men, and Jehol Province, which supported about 100,000 armed men, now must sustain only a special law maintenance force of 16,000.

Critics and publications hostile to Japan make much of the fact that organized banditry continues in all of the Manchurian provinces, and the Japanese themselves admit that there are still nearly 100,000 bandits to be contended with. But there is a definite campaign under way for the extermination of banditry, and the new government is making successful efforts to furnish employment on constructive projects for bandits who voluntarily lay down their arms.

Assuming that the combination of Manchoukuo's standing army and the existing bandit gangs total 200,000 men, it is probable that the burden of supporting this combined force is less than the former burden of supporting the 300,000 mercenary soldiers maintained by the former régime. And while no statistics are available, it is probable that there were nearly 100,000 bandits in Manchuria even when the former government was at the height of its power.

The present army is properly disciplined and well behaved, whereas Manchuria's former army was notoriously addicted to the levying of illegal and extortionate taxes and confiscatory fines. These latter abuses have been entirely done away with.

The fact that conditions in Manchuria are to-day incomparably better than those existing in China proper is evidenced by the fact that during the first seven months of this year 211,200 Chinese immigrants entered Manchoukuo through the Port of Dairen and many other thousands entered through Newchwang, Antung, and Hulutao. For the first time in Manchuria's history a government exists there which is attempting to handle these immigrants and the unemployment problem through an efficient government organ. The Manchoukuo Labor Distributing Agency exercises strict control over surplus immigration and registers and assists the seasonal flow of farm labor.

Many innovations are being made which testify to the stability and widening authority of the new government. Provincial, county, and village peace preservation committees are being entrusted with the maintenance of law and order in their own areas, and the difficulties of banditry are more than doubled by the efforts being made to equip all towns and villages with field wireless sets so that help may quickly be summoned.

Japan is already working on plans to turn over to the Manchoukuo Government many of the special treaty rights she obtained from Russia and China. Manchoukuo is to be granted an equal share of authority in all towns and concessions along the South Manchuria Railway, and there will be a gradual merging of authority until Japan will surrender all administrative powers except in the small leased territory which includes Dairen and Ryojun.

Modernization of laws, courts, and prisons is proceeding at such a rapid rate that Japan plans to surrender her extraterritorial rights in less than two years. This development is causing considerable uneasiness to Americans and other foreigners who live in Manchuria. They fear that Manchoukuo may declare a unilateral abolition of extraterritoriality in 1935, in which event they would find their positions untenable unless their governments, should decide to grant formal recognition to the new State.

The new Manchoukuo tariff went into effect late in July and in spite of the fears of foreign businessmen in Manchuria, the new schedules have proved to be fair in most respects and do not accord any particularly favorable avenues for the importation of Japanese goods. In general, the new tariff reduces the cost of living for the common people, and American importers of farm machinery and building materials have benefited greatly by sweeping reductions. Importers of all lines of goods also report that collections are better, that the volume of business is improving, and that they have been greatly benefited by the development of a sound currency system.

Japan, of course, is enjoying the bulk of the trade with Manchoukuo and will probably continue to do so. She will always enjoy the important advantages of a short haul, of the presence in Manchoukuo of thousands of Japanese merchants, and of the fact that her representatives suffer less from the language handicap. At the moment, Japan has an additional advantage afforded by the depreciation of the yen down to a point of parity with the silver dollar.

One of the most serious problems with which the new government has had to contend has been the establishment of a sound currency system. During the rule of the late Marshal Chang Tso-lin and his son, Marshal Chang Hsueh-liang, various banks in Manchuria issued unsecured paper money to such an enormous total that the actual billions in face value has never been determined. So depreciated had some of these issues become that notes of $100 would exchange for only $2 in silver.

The first step taken by the new government was the organization of the Central Bank of Manchoukuo, with a paid-up capital of $30,000,000 silver. Japanese and Manchurian financial experts then toiled for months over the books of the various banks of issue which had been controlled by the ousted Manchurian war lords, and finally worked out an equitable ratio valuation for the retirement of all outstanding notes. During the first year of its existence the new Central Bank retired and destroyed $84,000,000 of the old depreciated currency.

At the end of its first year of business, July 31, 1933, the Central Bank of Manchoukuo declared a six per cent dividend and showed deposits of $97,000,000, or more than $26,000,000 in American money. Net profits for the first year of operation total $513,225 and domestic exchange operation reached the astonishing total of $454,000,000.

The highest figure for outstanding loans was $124,000,000, and the bank now has $122,000,000 of its own notes outstanding. These notes have always been maintained at par by a specie reserve ranging between 57 and 69 per cent. The bank now operates 115 branches scattered over the three Manchurian provinces and Jehol, and is continually expanding the scope of its operations.

Because of the fact that bandits were eliminated from many of the more productive sections of the country more rapidly than had been thought possible, the new government's revenues for the first fiscal year were larger than had been expected, and the first year was ended with a small surplus. The government's budget for the second year, ending June 30, 1934, totals $149,169,178, an increase of $11,213,178.

The government announces that during its second year it will float only one loan, a special bond issue of $7,000,000 for the construction of State highways. The government has an ambitious plan for building about 5,500 miles of modern highway before the end of 1937. Already more than 600 miles of this system have been completed.

Late in July of last year, the postal service in Manchuria was completely disrupted by a decree from Nanking, which ordered the complete suspension of all post offices in the Manchurian provinces and the simultaneous return of all postal employees to China. Most of the employees did so, actuated by patriotism and by the fact that if they disobeyed, they would forfeit all bonuses and rights to pensions.

The new Manchoukuo Government, in many cases, inherited post offices in which all existing records had been destroyed, and in most cases it was necessary to train inexperienced men. To-day Manchoukuo operates more than 900 post offices, and the efficiency of the postal force is steadily increasing. China still maintains an absolute postal ban against Manchuria and Jehol and permits no mail to go to Europe through Manchuria and over the trans-Siberian route.

Before the Japanese occupied Mukden two years ago, Chang Hsueh-liang's government, instead of Nanking, controlled the telegraph and wireless systems, and most of the operators destroyed their equipment and fled. This necessitated an entire reorganization and the training of personnel for nearly 600 offices and stations. Before the "Mukden incident," the Japanese operated their own telegraph company in the South Manchuria Railway zone, but this has now been amalgamated with Chang Hsueh-liang's former system and is owned by the Manchoukuo Telegraph and Telephone Company. This concern, which is capitalized at Y.50,000,000, is jointly owned by Manchoukuo and Japan.

The management and operation of the government-owned railways have been turned over to the South Manchuria Railway Company. Old abuses have been done away with, improvements have been made in equipment, and freight and passenger schedules are observed with clock-like regularity. The earnings of all railways have shown a marked increase during the last 18 months.

Two important new lines have been completed. The first of these is the eastern extension of the Kirin-Tunhua line eastward to the Chosenese border, where it links up with a new Chosen railroad running inland from the seaport of Rashin. This new link makes it possible to go from Hsinkiang, the capital of Manchoukuo, to Tokyo in 35 hours. Hitherto the trip has taken 65 hours. The Japanese Government has subsidized two lines of fast steamers to run from Rashin to Niigata, where rail connections are made for Tokyo.

The second important piece of construction runs in a rough semi-circle from a point north of Harbin westward to join the Taonan-Chichihar Railway west of Harbin. This diverts much traffic from the Chinese Eastern system, in which Russia has a half ownership.

In the field of education, considerable advancement has been recorded. Counting everything from kindergartens to colleges, there are now 8,439 schools in Manchuria, not including those in the Japanese railway zone and in Ryojun and Dairen. There is a very evident tendency in the development of the new school system to emphasize vocational education.

The most serious internal problem which Manchoukuo faces to-day, aside from the suppression of banditry, is that of disposing of surplus crops and teaching peasants the merits of diversified farming.

Official estimates of this year's yield of millet, soya beans, kaoliang, rice, maize, and wheat is 18,192,000 metric tons, an increase of nearly 3,000,000 tons over last year's yield. Soya beans, which formerly made Manchuria exceedingly prosperous, this year threaten to bring ruin to the peasants and to many of the mills which prepare bean cake and bean oil for export. The crop is expected to exceed 5,000,000 tons. In the past, the export of soya beans has averaged about 3,800 tons a year.

In Jehol progress has not been nearly so notable as in the three provinces of Manchuria, but this is natural because the occupation of Jehol was not completed until late last winter. One of this first things the Japanese military and the Manchoukuo civil authorities had to do in Jehol was to provide for the relief of tens of thousands of persons who had been impoverished by the previous Chinese régime.

One of the first needs of the province was the construction of costly highways through mountainous regions. Inadequate telephone and telegraph lines had to be extended, and the number of post offices has been greatly increased. Several water power projects are being developed and branches of the Central Bank of Manchoukuo are making good progress in retiring the paper money which was even more debased than that of Manchuria.

One of the chief sources of revenue for the former Jehol Government was opium, which the Manchoukuo Government is now handling as a State monopoly, and has reduced by exactly one-half the tax on all lands upon which the opium poppy is grown.

The cash costs of Japan's action in Manchuria have been enormous, as is shown by the figures in the budget of the Tokyo Government. There has also been appalling cash cost, occasioned by the Chinese boycott of Japanese goods, which must show alarmingly upon the ledgers of many of Japan's great commercial houses.

It is too early to estimate what tangible gains will accrue to Japan as a result of its activities in Manchuria. It is, of course, a gain to have brought an end to chaos in the immense and fertile area adjoining Chosen, and it is a very distinct gain to have ousted from Manchuria a régime which was apparently bent upon the destruction of Japan's enormous economic interests there.

Now, as in the past, Manchuria seems a failure as an outlet for any considerable portion of Japan's surplus population, but when banditry is finally ended and the natural resources of the country are properly developed, industrial Japan will probably reap a rich harvest from the fertile Manchurian plains.

Prof. Lin Tung-hai's Book on Labor Movement

Of prime importance to all those who have an interest in labor questions in China is a newly issued work by Professor Lin Tung-hai, known to English readers as Jefferson D. H. Lamb. This bears the title, "Labor Movement and Labor Legislation in China," and is issued by the China United Press. According to pronouncement of Mr. Chen Kung-po, Minister of Industry, "this is the first comprehensive book on Chinese Labor written with real expert knowledge and it is a product of many years of research and of teaching in various leading Universities in China. The author is Adviser to the Ministry of Industry and formerly was Professor of Social Legislation at Yenching University, Peiping.

The work, in the words of the author, "is an attempt to give an account of the conditions under which the Chinese wage-earners lived during the period 1912-1931, taking into consideration not only the economic, but also the social and political aspects." The developments of the revolutionary period are dealt with adequately and legislative enactments of the period under review are set forth comprehensively. As a work of reference on the subject of labor movement problems and labor legislation in China the book has unique value.

Pardon—Our Mistake

It is regretted that inadvertently a brief article on "The Russian Gold Industry" which appeared in the October number of *The Far Eastern Review* was attributed to *The Mining Magazine*. This was incorrect. The article in question appeared originally in *The Mining Journal* to which it should be credited.

Japanese Shipping and Shipbuilding

THE shipbuilding industry in Japan showed remarkable activity during and after the second quarter of 1933 although that of the world as a whole remained inactive. And, indications are that the recent standard of lively construction in Japan is likely to be maintained for some years.

This notable recovery of Japan's shipbuilding industry is attributed to three major factors, which are: (1) improvement of the shipping market, (2) larger naval budget, and (3) the better ships act.

The unprecedented depreciation of the yen exchange rate, which has accounted for various economic changes in Japan, is also held largely responsible for the improvement in the shipping market; for one thing, it induced large Nippon shipping concerns to operate their vessels in foreign waters, and this subsequently resulted in an immediate decrease in the space supply in the near seas. And this tendency was further enhanced by the scrapping of old tonnage under the better ships act. Hence the substantial improvement of the shipping market.

As regards the larger naval appropriations, which resulted from the reinforcement of the national defence, its favorable effects on the shipbuilding industry are too obvious to explain.

Now about the better ships act: it went into effect in October, 1932, following the approval thereof by the 63rd session of the Diet. It provides for a subsidy amounting to Y.11,000,000 to be granted during 1932, 1933, and 1934 on the construction of 200,000 tons of freighters of certain standard on condition that twice as much of the old tonnage should either be scrapped or rendered completely out of commission.

During the fiscal years of 1932 and 1933, keels were laid for 150,000 tons of ships under the foregoing better ships act as was expected, and therefore, the construction of the remaining 50,000 tons is to be commenced during the 1934-5 fiscal year which begins in April, 1934.

It was under such favorable circumstances that the tonnage of ships under construction in Japan registered jerky increases as seen in the accompanying table: (Unit: ton).

Months (1932) End of	*Ships under construction*	*Months (1933) End of*	*Ships under construction*
September	40,492	March	64,570
October	39,506	April	81,790
November	55,245	May	88,620
December	67,730	June	87,805
(1933)		July	88,095
January	67,110	August	82,788
February	73,135		

Note the fact that the tonnage of ships under construction in and after April, 1933, was twice as large as that of September and October, 1931.

As regards the prospects of Japan's shipbuilding industry in and after 1934, much depends upon the naval building program. The construction under the better ships act terminates at the end of 1934, while observers agree that after this the shipping market does not bid fair to remain active due to the recovery of the yen exchange rate and also because of the accelerating international economic rivalry following the failure of the World Economic Conference. So the naval projects, especially the forthcoming second reinforcement plan, loom large.

If and when approved by the present session of the Diet, the Japanese Navy is to build more than 40 naval vessels including light cruisers, aircraft carrier, destroyers, submarines, torpedo boats, oil tankers, factory ships, and so on, at an estimated cost of Y.430,000,000 during four years beginning in 1934-5, and the 1934-5 allotment of the appropriation is reported to be Y.66,000,000. In view of the fact that the foregoing naval projects will furnish Japan's shipbuilding yards with plenty of work, the shipbuilding industry in this country will remain active for the coming few years. Nevertheless, the builders will not be able to clear enormous profit out of the naval project as the unit cost is to be fixed at a low level and besides if and when the shipbuilding companies made a large margin of profit that would provoke a popular demand for levying of higher taxes.

* * *

Supplementing the foregoing the following report will be found of interest, as it consists of excerpts taken from the report on Economic Conditions in Japan published by Mr. G. B. Sansom and Mr. D. W. Kermode, of the British Embassy at Tokyo (H.M. Stationery Office: 3s. 6d., net), as published in "The Shipping World."

On account of a decrease in 1931 in contracts for new ships many of the shipyards diverted a large part of their normal activities to the building of bridges, the manufacture of train cars, pipe lines and motor trucks, and to general structural engineering. In 1932, the shipbuilding industry became even further depressed. Official figures show that during the first ten months of the year 58 vessels of over 100 tons gross register and of a total gross tonnage of 54,911 were launched from Japanese yards, but even of this small figure the greater part consisted of small coasting and harbor craft. Approximately 66 per cent of the total number of vessels were diesel or oil engined, the remainder being driven by steam.

On October 1, 1932, the Government introduced a subsidized scheme for the improvement of shipping and the provision of employment in shipyards. Under this scheme 400,000 gross tons of old ships are to be scrapped and 200,000 gross tons of new ships built over the next three years. All materials, engines and fittings are to be Japanese and the new vessels must be of not less than 4,000 gross tons and over 13½ knots speed. The subsidy to be granted varies between Y.45 per ton for vessels under 14 knots and Y.54 per ton for vessels over 18 knots speed, and is to be granted to the owners of new vessels on condition that they scrap not less than two tons of vessels of 25 years and over for each one ton of new vessels subsidized.

The immediate result of this scheme, which is expected to cost upwards of 10 million yen, has been to increase the market price of old vessels, and this, coupled with the nearly 100 per cent advance in the price of steel, has tended to deter the placing of new contracts. Consequently it is felt that only vessels which would have to be built in any case will benefit by the scheme.

Despite these circumstances, the prospects for 1933 are decidedly brighter than at any time during the two previous years. A general improvement in the shipping business, due entirely to the fall of the yen, is no doubt encouraging owners to increase their tonnage.

Progress of Shipbreaking

No picture of Japanese shipping and shipbuilding would be complete without a brief reference to the Osaka shipbreaking industry. There has been for some time past a considerable importation of ships for breaking up, one of their principal uses being to furnish scrap metal of good quality for iron and steel foundries. The ships are broken up "in bond" and since the material thus obtained is classed as iron and steel "waste or old, fit only for remanufacturing" it comes to the foundries duty free. As their overhead expenses are, moreover, small, these foundries earn good profits, so that they are able to pay considerably higher prices to the breakers than the ordinary smelters would pay for the metal as genuine scrap.

There is, of course, a good deal of idle semi-obsolete tonnage in Japan, and it would seem more profitable to break up old Japanese ships, but most of these are heavily mortgaged and their owners cannot dispose of them without lifting the mortgage. It appears also that old Japanese ships, by the time they come into the breakers' hands, are so deteriorated that a very much smaller proportion can be used for remanufacture than in the case of foreign vessels.

Regardless of these acknowledged facts the Japan Shipowners' Association have for some time urged the Government to impose a prohibitive tariff which would result in the exclusion of old foreign tonnage and enable the Japanese shipping companies to find a market for their own discarded ships. The submissions of the Shipowners' Association were met with vehement protests

from the shipbreakers, who pointed out that even if all the obsolete tonnage in Japan were to be scrapped there would still not be enough metal for one year's requirements, and that as soon as foreign vessels were banned Japanese owners would advance their prices to prohibitive figures and thereby throw some ten thousand men out of employment.

Clash of Conflicting Interests

The subsidy scheme referred to above was the Government's attempt to satisfy these conflicting interests. While this scheme was being prepared in the summer of 1932, breakers kept temporarily out of the market anticipating the appearance of a large quantity of Japanese obsolete tonnage in the yards at cheap prices as soon as the scheme came into force. Contrary to expectation, however, owners of old tonnage, when the actual terms of the subsidy became known, advanced their prices to such an extent that breakers were very soon able to re-open negotiations for foreign vessels, and in spite of having to pay an arbitrary charge of Y.1 per gross ton to the Customs they are still in a position to purchase better and cheaper vessels from abroad.

Japan's average annual import of pure scrap is roughly 600,000 tons, and a further 400,000 tons, it is estimated, is produced in Japan from scrapping old ships, miscellaneous machinery and railway material. In practice it has been found cheaper to import vessels instead of the scrap and break them up, and this process has the additional merit of providing employment. Even if Japanese vessels were to be given preference, it seems clear that since the total tonnage of Japanese owned steamers of over 25 years of age scarcely exceeds 500,000 the import of foreign vessels must continue.

Effect of the Fall in the Yen

Few interests have profited more from the fall of the yen than Japanese shipping. During the few years immediately preceding the reimposition of the gold embargo, however, conditions had been growing steadily worse. Owing to the continued depression in trade, the second half of 1930 showed a gradual decline in trip and time charter rates. Although various efforts were made to improve matters, by attempting, for instance to induce owners to combine for the purpose of standardizing rates, and by laying up vessels in order to create a scarcity of tonnage, none of these were successful, and conditions remained unchanged till February, 1931, when numerous vessels found employment in the carriage of wheat from Australia to China and Japan. This gave the market an impetus which lasted till June of the same year, when the slump set in again and brought the year to a close with lower rates than ever. These circumstances, aggravated by an intensifying anti-Japanese boycott in China and by the subsequent departure of the pound sterling from a gold basis, caused a continuous increase in idle tonnage, until at the end of 1931 out of a tramp tonnage of nearly four million deadweight tons normally employed in ocean service more than 500,000 deadweight tons were laid up.

Several ships were laid up also as the result of an agreement concluded in April, 1931, between the Nippon Yusen Kaisha and the Osaka Shosen Kaisha, which provided for joint operation of vessels and joint handling of passenger and freight traffic under an executive committee composed of officials from each company. Some such agreement had become urgently necessary in order to eliminate wasteful competition between these two companies, both of which had ceased to pay dividends since March, 1930.

A Welcome Revival

Although little improvement was seen at first after the reimposition of the gold embargo in December, 1931, the rapid decline of the yen during the second half of 1932 subsequently brought about a welcome revival. Japanese owners began to realize the advantage of placing their boats in trade where freights would be paid in foreign currencies, and many of the large tramps owned in Japan have been trading abroad during 1932. Towards the close of the year, in fact, some 20 per cent of the total Japanese tramp tonnage was operating in European waters, while 40 per cent was retained in East Asiatic waters and 33 per cent was distributed in various waters throughout the world. This resulted not only in furnishing owners who had transferred tramps to foreign waters with good yen profits, but also in leaving the coasting trade free for smaller tonnage. By the end of 1932 more than one-half of the tonnage laid up at the end of 1931 had been reabsorbed into service.

According to the Yokohama Specie Bank the total revenue of Japanese shipping concerns for the period January 1 to November 30, 1932, may be roughly estimated at 150 million yen, as compared with about 70 million yen for the corresponding period of 1931. Although these figures make no claim to strict accuracy, they serve at least to indicate how effectively the fall of the yen, by stimulating the export trade and improving the competitive power of Japanese tramps, has restored relative prosperity to Japanese shipping. Nevertheless, it must not be supposed that this prosperity is of a permanent character. In responsible quarters it is realized that the present advantage enjoyed by Japanese shipping as a result of the cheap yen cannot last long unless there is an early improvement in shipping conditions throughout the world.

The gradual decline from June, 1930, and the subsequent recovery after June, 1932, are clearly shown in the following table of charter rates during that period :—

PER TON PER MONTH.

(FOR A 6,000 TONS DEADWEIGHT STEAMER.)

	Coasting trade. *Yen.*	*World trade.* *Yen.*
June, 1930	1.30	1.70
December, 1930	1.10	1.30
June, 1931	1.30	1.60
December, 1931	1.00	1.10
June, 1932	1.20	1.30
December, 1932	1.50	2.00

Towards the end of 1932 much prominence was given in the press to reports of a contemplated merger between the Nippon Yusen Kaisha, the Osaka Shosen Kaisha and the Kinkai Yusen Kaisha. Conversations were actually held between the presidents of the Nippon Yusen Kaisha and the Osaka Shosen Kaisha, but, owing to a wide divergence of traditions and the difficulty of reconciling the rival Mitsubishi and Sumitomo interests behind these two companies, negotiations have, for the time anyway, fallen through.

Government subsidies to Japanese shipping lines for the financial year 1932-33 are as follows :—

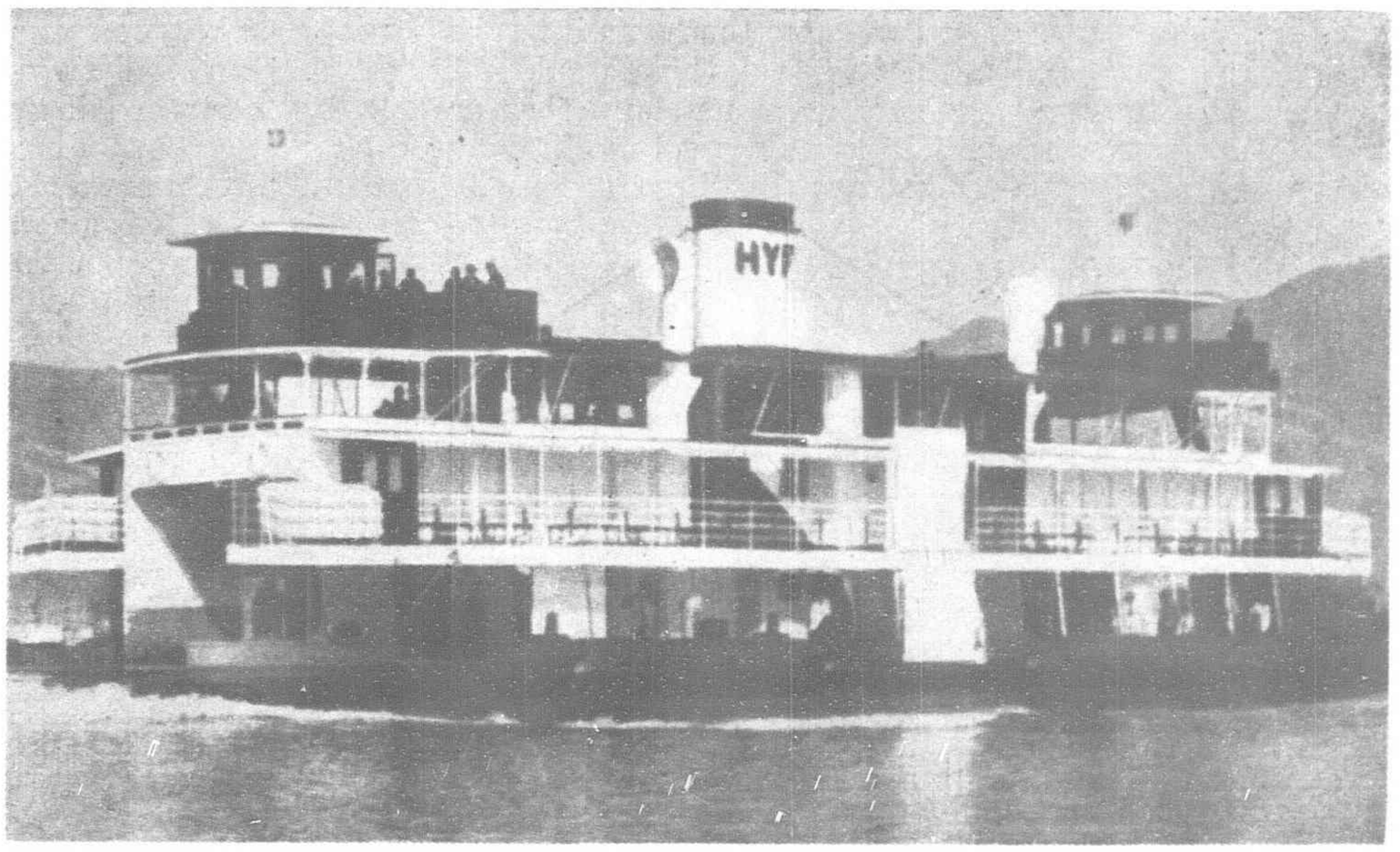
	Yen.
By the Central Government	10,584,000
By the Korean Government	825,000
By the Formosan Government	1,508,062
By the Japanese Saghalien Administration	Not specified
By the Kwantung Leased Territory Administration ..	31,770
By the South Seas Mandated Territory Administration	723,000

New annual rates, operative for the three years beginning April 1, 1933, will be introduced at the next session of the Imperial Diet. Shipping companies fear a reduction of about 1½ million yen.

Tung Pu Railway Progress

It is rumored that the Tung Pu Railway is to be a joint undertaking by the National and Provincial Governments. Some time ago French engineers were instructed by Nanking to extend this line south from Yützu to Taiku, a distance of 40 miles. As this extension was to follow the route surveyed some 25 years ago, and which Marshal Yen intended to use as part of the route of the Tung Pu line, it became necessary for him to find an alternative route at least as far south as Chiehsiu. It is expected that this meter gauge extension to Taiku will soon be opened to traffic. The bulk of the earthwork is finished, and a small locomotive shed at Yützu, standing forlorn on the north-west side of the city, has been for many years a mute witness to a scheme which was abandoned through causes arising out of the upheaval in 1909. Work is now proceeding on a heavy stone bridge near the existing station at Yützu. According to local reports, contracts were signed with European firms some time ago for 5,000 tons of rails at a c.i.f. price, China port, or £5 10s. per ton, and also for three locomotives, but apparently finances have been a stumbling-block recently. Marshal Yen has now approached the Chamber of Commerce with a demand for a loan of $3,000,000, and it is safe to assume that the money will be forthcoming.

New Vehicular Ferries at Hongkong



The "Man Kung"

AN interesting addition to the fleet of ferry vessels in the harbor at Hongkong is the *Man Kung*. This is the first to be completed of three vessels of unusual type that were ordered last year from the Hongkong and Whampoa Dock Co. by the Hongkong and Yaumati Ferry Co. for conveyance of passengers and vehicles over a new harbor crossing between the Island and the mainland. The *Man Kung* is remarkable in that her beam is 43 feet, which is nearly one-third of her length of 130 feet overall. Her performance at her trials over a measured course of a mile in Kowloon Bay was wholly satisfactory to both owners and builders, for on six runs at full speed she exceeded expectations, attaining a speed of 10.2 knots on one of the runs. Details with regard to her mechanical equipment, as published in *Eastern Engineering and Commerce* are given as follows :

The two Gardner Full Diesel engines, each developing 400 b.h.p. and driving twin propellers at either end as desired, worked smoothly and gave no trouble. There was a remarkable absence of vibration even at top speed, and the vessel was entirely steady under helm.

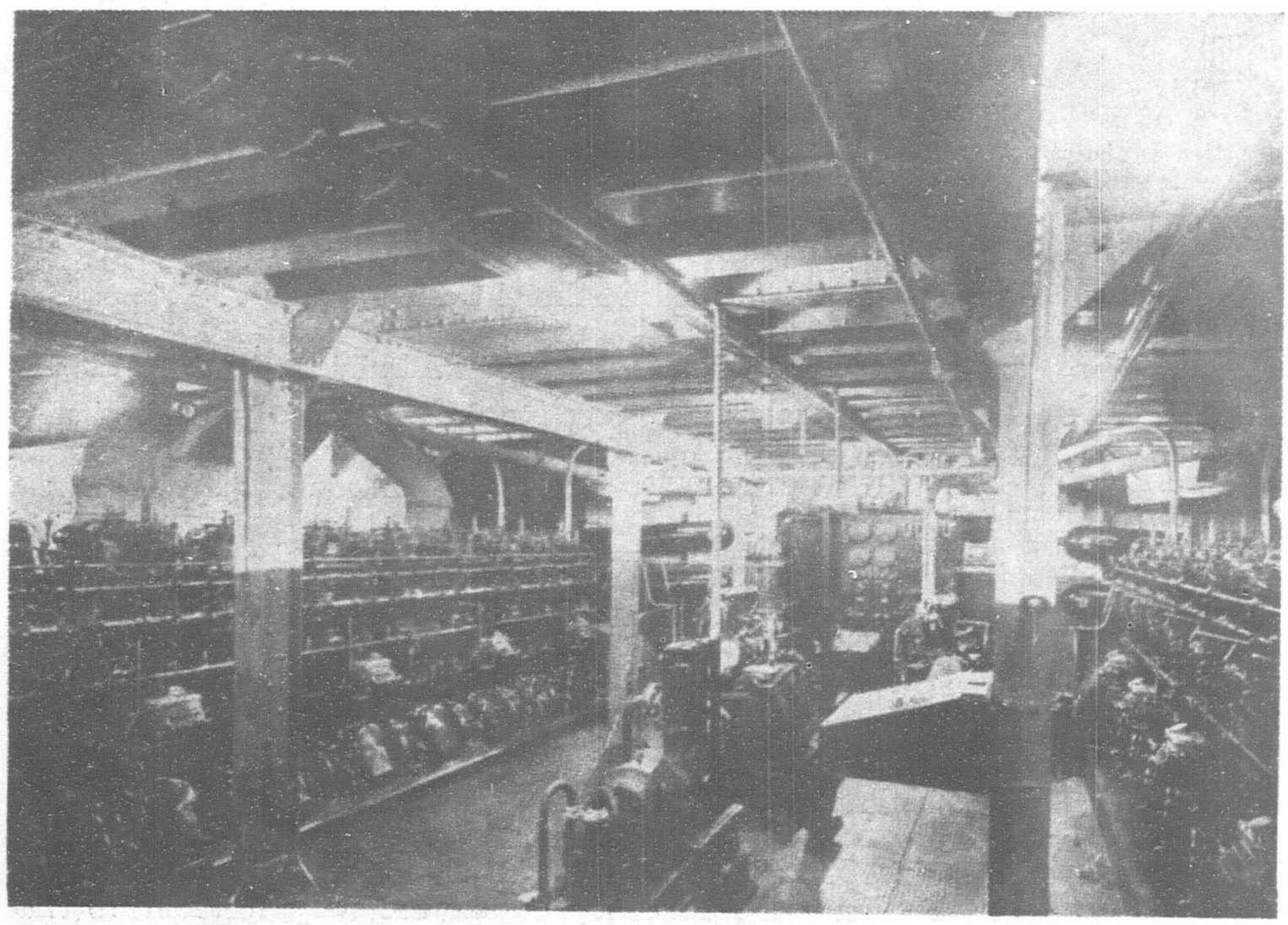
A variation to the tests, when the vessel was operated at graded speeds and also subjected to other conditions, demonstrated astonishing mobility and powers of turning. The *Man Kung*, it was amply demonstrated, could turn completely in its own length.

As contributing to this satisfactory condition of affairs, those concerned are to be complimented on their choice of the electric hydraulic steering gears, each of which is controlled by telemotor from separate wheelhouses. The ferry, so to speak, leaps to the slightest guiding touch of the helmsman, the steering gear, because of the special features attached, being responsive to the degree of sensitiveness.

The dimensions of the vessels are :—Length over-all, 130-ft. ; breadth extreme, 43-ft. ; depth moulded to vehicular deck, 12-ft. 3-in. A large space is provided for vehicles on the main deck, 21-ft. in breadth and 11-ft. 6-in. clear height for the full length of the ferry, and will accommodate 18 private cars, or 12 three ton lorries. Abreast of this on each side, and in the saloon below the main deck, 100 third class passengers will be carried, 275 first class and 100 second class passengers will be carried on separate shade decks.

The ferry is, as stated, propelled by two " Gardner " Full Diesel engines, the highest power of their type yet constructed. They are designed to develop 400 b.h.p. at a speed of 290 r.p.m. and have eight cylinders 12½ in. in diameter, whilst the piston stroke is 15-in. Each engine may drive a propeller forward or aft, according to the requirements, and suitable clutches are provided. Although they are of the reversing type, there is no need in the ordinary way to reverse the engines, since to stop or reverse the direction of the ship the forward clutches are engaged. Arrangements are made so that the control levers of the clutches are inter-connected, and the engaged clutch must be taken out before the other clutch can be put in. A neutral position is provided in which both clutches are out of engagement.

In the ship are two auxiliary sets driven by 38 b.h.p. Gardner high-speed Diesel engines running at 1,000 r.p.m. There are two rudders at each end and electric hydraulic steering gears each controlled by telemotor from separate wheelhouses, fitted below deck and direct connected to the rudders. Warping and anchor handling is carried out by means of four electric capstans.



The two 400 b.h.p. Gardner Diesel Engines in the "Man Kung"

Vessels for Manchoukuo

Orders for nine police and naval boats have been placed in Japan by the Manchoukuo government, These consist of two 200 ton boats, four 45 ton boats and three 10 ton craft.

The ships are to used, solely for coastal patrol and police duty, it was said. Various newspapers pointed out that when Marshal Chang held forth at Mukden, Manchuria had a fleet of nine gunboats and 12 smaller police craft operating along the coast of the Gulf of Pechili and the coast of the Yellow Sea. Most of these fled at the time of the occupation of Mukden in September, 1931, and there now remain in possession of the Manchurian government only two or three small boats of inferior type and great age. As a result of the lack of police boats, cases of piracy and smuggling have been increasing along the Manchurian coast.

Nippon Dempo added the additional and startling information that this order for police and coast guard boats was the basis of recent rumors that the Japanese navy intended to increase its strength by utilizing Manchoukuo vessels.

Tokyo's New Central Post Office Most Modern in the Orient Due to Mechanical Equipment

By Y. TAJI.

THE New Tokyo Central Post Office is situated in the front of Tokyo Station across a broad way and its general mail service was opened on November 6, 1933. The writer recently had an opportunity of inspecting all the interior parts of this new post office.

The construction has been completed after a period of six years since the first foundation work commenced. The building has five floors and a basement occupying a total area of 36,480 square meters and is the largest and most modern post office in the Orient with unparalleled mechanical conveying and handling equipment for an enormous volume of mail matter.

Mail matter collected by post offices in Tokyo urban and suburban districts and mail arriving from foreign countries and all parts of Japan is being handled through the Central Post Office. The volume is tremendous and requires complete mechanical and manual equipment unlike ordinary post offices.

The Tokyo Central Post Office is not only the largest in Japan, but also is the first to be equipped with the most up-to-date mechanical conveying system. The general design of the mechanical handling system was carried out by Professor S. Noguti of the Tokyo Imperial University and the machinery was mainly supplied by the Hitachi Engineering Works, Ltd., of Japan.

The Building

The building is a composite steel and concrete structure and was designed after the colossal experience of the Great Earthquake of 1923. The construction may be considered as one large spacious building with a base of nearly trapezoidal shape subdivided into five floors. Partitions on each floor being very few and ceilings being very high, extra strong structural construction was adopted. Throughout the whole area from the foundation to the highest floor, strong pillars are erected at a distance of six meters apart and are rigidly connected by large beams at floor and foundation levels so as to constitute a large cage structure. The plan forms nearly a trapezoid or a rectangle with the north-eastern corner shaved off, the longest side being 126 meters, the shortest side 72 meters and the total area 35,295 sq. meters, of which 4,000 sq. meters is allotted for foreign mail and 7,000 sq. meters for ordinary mail and 7,000 sq. meters for parcel post. The height of the main structure above the ground level is 27.9 meters and the heights between floors are four meters in the basement, 6.5 meters on the ground floor, 5.5 meters on the second and third floors, 4.5 meters on the fourth and fifth floors, and the height of side walls on the roof is one meter. The high ceilings and large windows together with two inside areas give ample daylight and ventilation.

There are many entrances. Postmen's entrances, special receiving positions for general mail and a large entrance hall are situated on the western side. The northern front has public entrances and a large waiting room, whilst telegraph messengers' entrances and the northern entrance hall are situated at the oblique side, while special receiving positions for parcel post are provided on the eastern side. The whole southern side is arranged for the arrival and departure platforms of mail motor-cars, which communicate with the handling rooms through twenty-one doors.

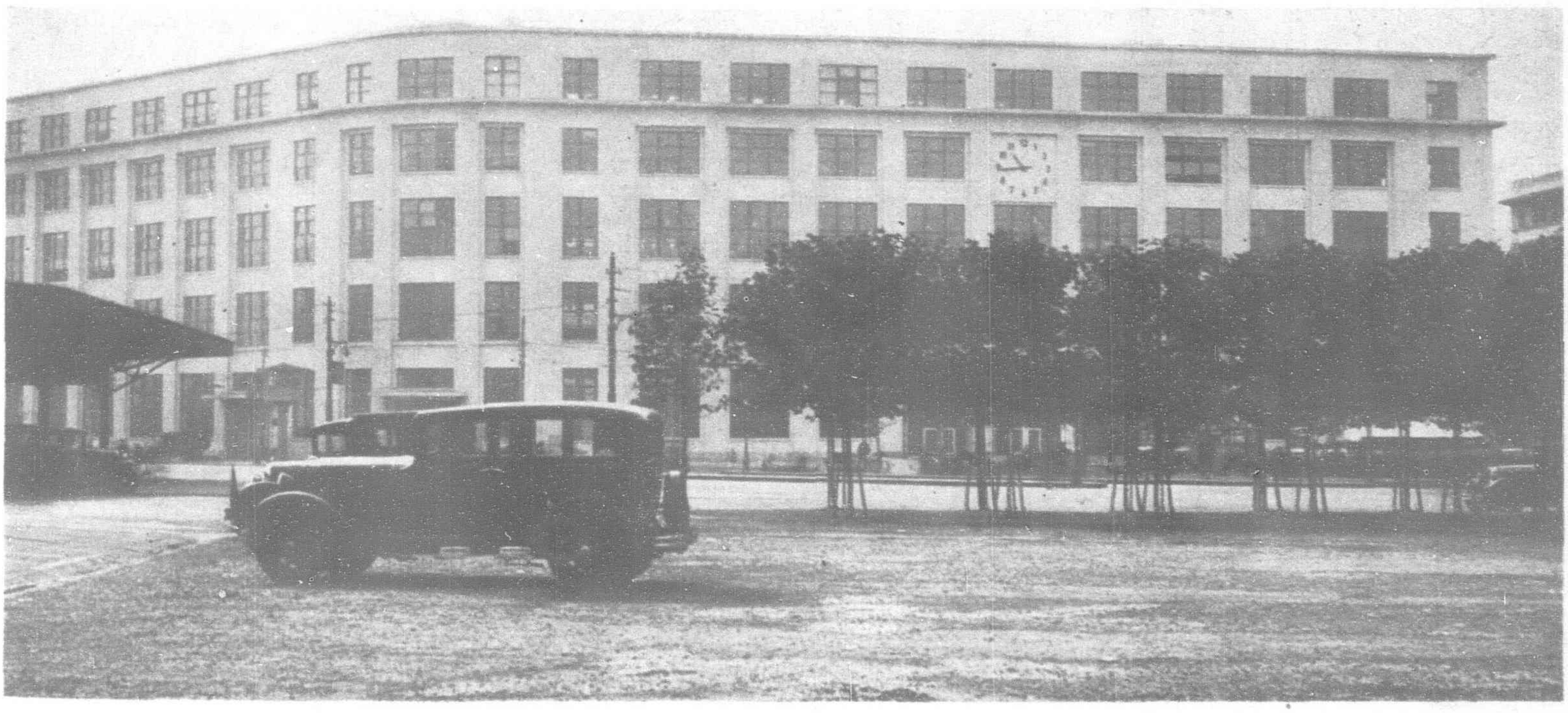
Two passenger elevators are provided in each main entrance, four internal stairways communicate with all floors, and two emergency stairways are fitted on the southern side.

The handling rooms are so arranged that foreign mail is handled on the third floor, general mail on the western side of the first and second floors, parcel post on the eastern side of the same floors, and the south-eastern corner of the third floor is allotted for the distribution of parcel post. The basement is for common use as well as for the repair, wash and tidying-up of mail bags, whilst the fourth floor is mainly used for business offices and the fifth floor for watchmen's rooms, dressing rooms, and bed rooms.

Handling of Mail and Routes of Transport

Beside the urban and suburban mails, the central post office deals with transit mail. The routes for the arrival and delivery of mail matter are as follows :—

(1) To and from south-eastern districts via Tokyo Station through underground tramway.
(2) To and from north-eastern districts via Ueno, Iidamachi and Ryogoku Stations by motor lorries.
(3) To and from Tokyo urban and suburban post offices by mail motor-cars.
(4) Direct collection and delivery by the central post office.



Front view of the New Tokyo Central Post Office

PLAN OF THE TOKYO CENTRAL POST OFFICE

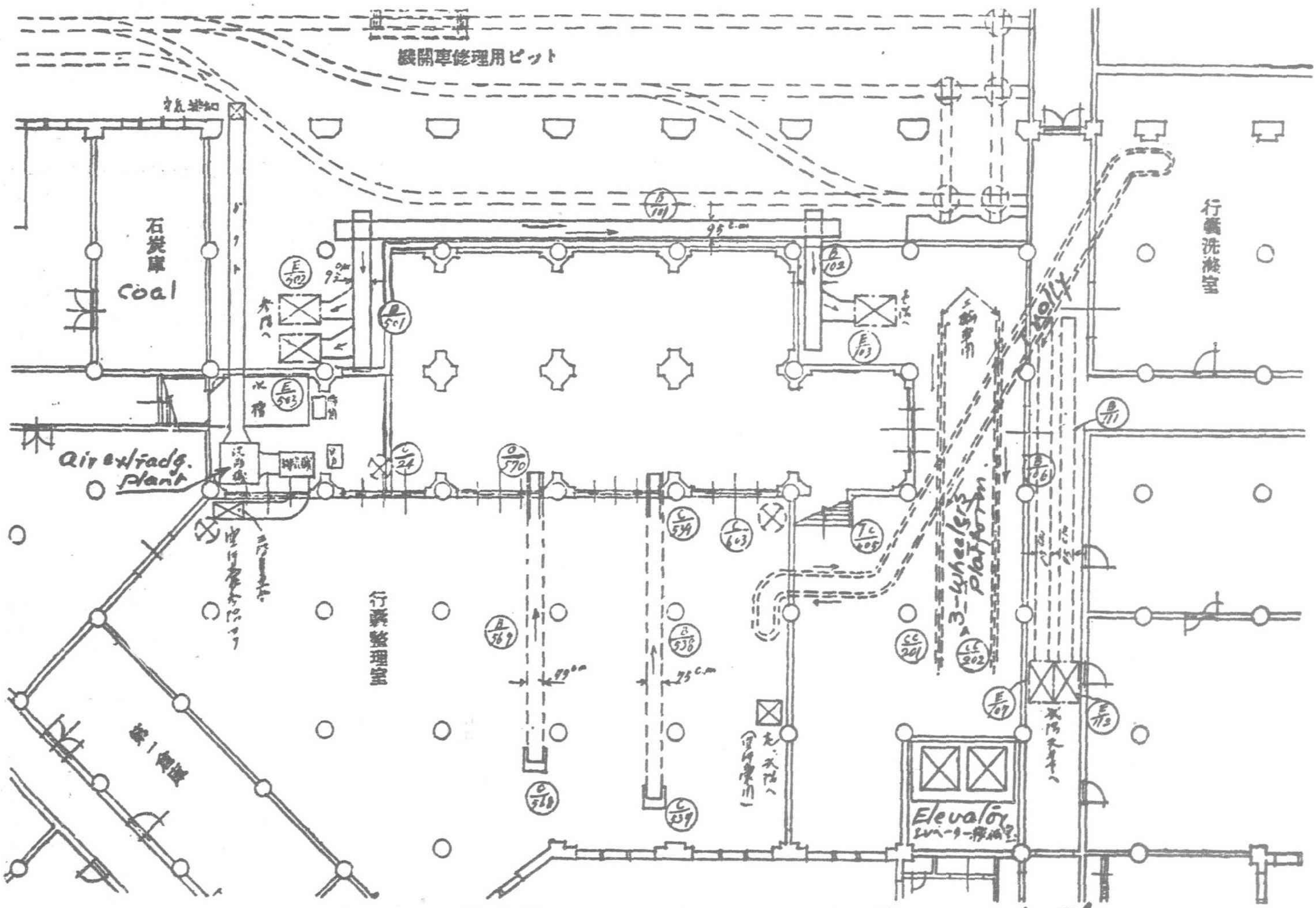
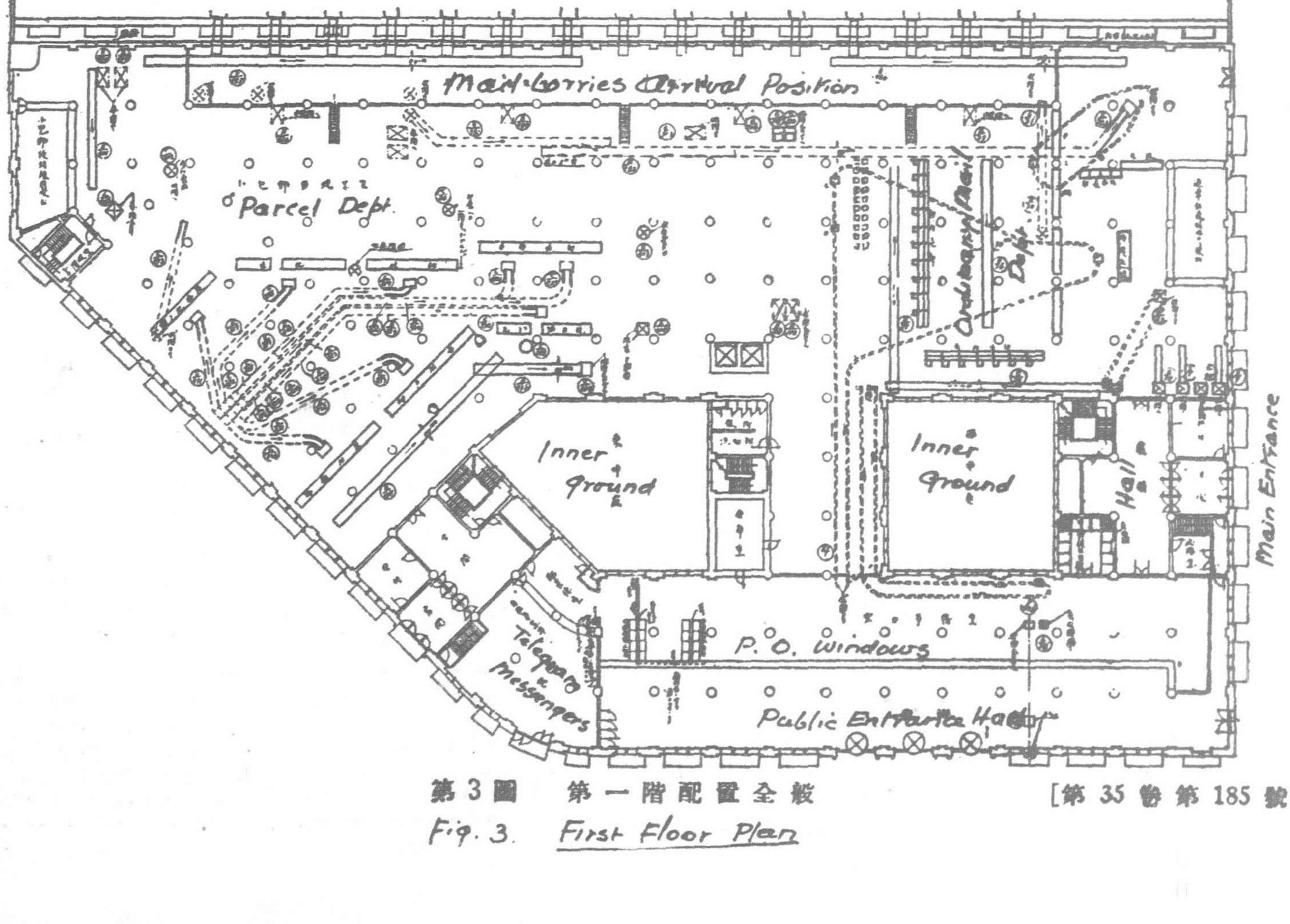


Fig. 2. 第2圖 地下階運搬設備 Basement Plan



第3圖 第一階配置全般

Fig. 3. First Floor Plan

Handling of Parcel Post.—A large area is necessary for the handling of the parcel post, as it forms the main part of mail matter in volume and weight. The handling rooms comprise an opening room on the third floor, an ordinary parcel sorting room on the second floor and a special parcel sorting room on the first floor.

Parcels arriving at Tokyo Station by trains from south-eastern directions are first carried by underground tram-cars to the post office basement and are unloaded on a steel belt conveyor moving toward the left hand side and by a rubber belt conveyor they proceed to two baggage elevators through automatic feeders.

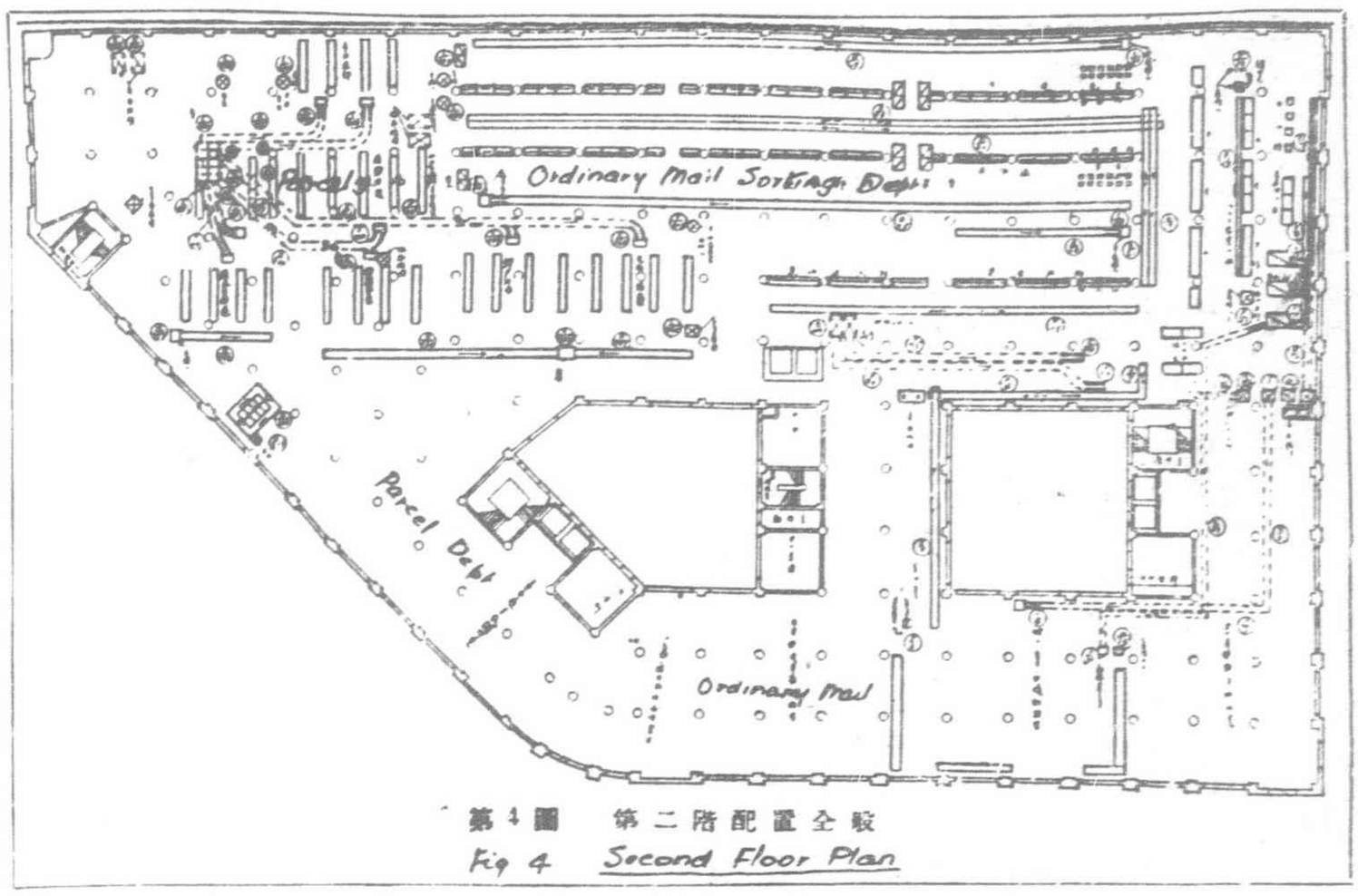
Parcels from north-eastern directions, Tokyo town and suburbs arriving by mail motor lorries are unloaded on the southern platforms of the building, whence they are placed on a belt conveyor of the handling room through four roller chutes and are transported to other baggage elevators.

Parcels directly received at the Post Office are not placed in mail bags, but they are carried by a belt conveyor to a lift.

Thus by means of the elevators and lifts, all parcels are conveyed to the mail bag opening room on the third floor. This room is shown in Fig. 5. Bags containing ordinary or special parcels are moved to their proper tables by belt conveyors and are opened thereon.

In opening the bags, considerable dust is produced which is unhygienic and reduces working efficiency, so that in order to prevent the spreading of dust in the handling room it is drawn through ducts fitted to each bench and is collected in the dust installation in the basement.

Ordinary parcels opened here are transported to the general sorting plant, which comprises four belt conveyors arranged rectangularly, and in the center eight chutes are opened. The parcels



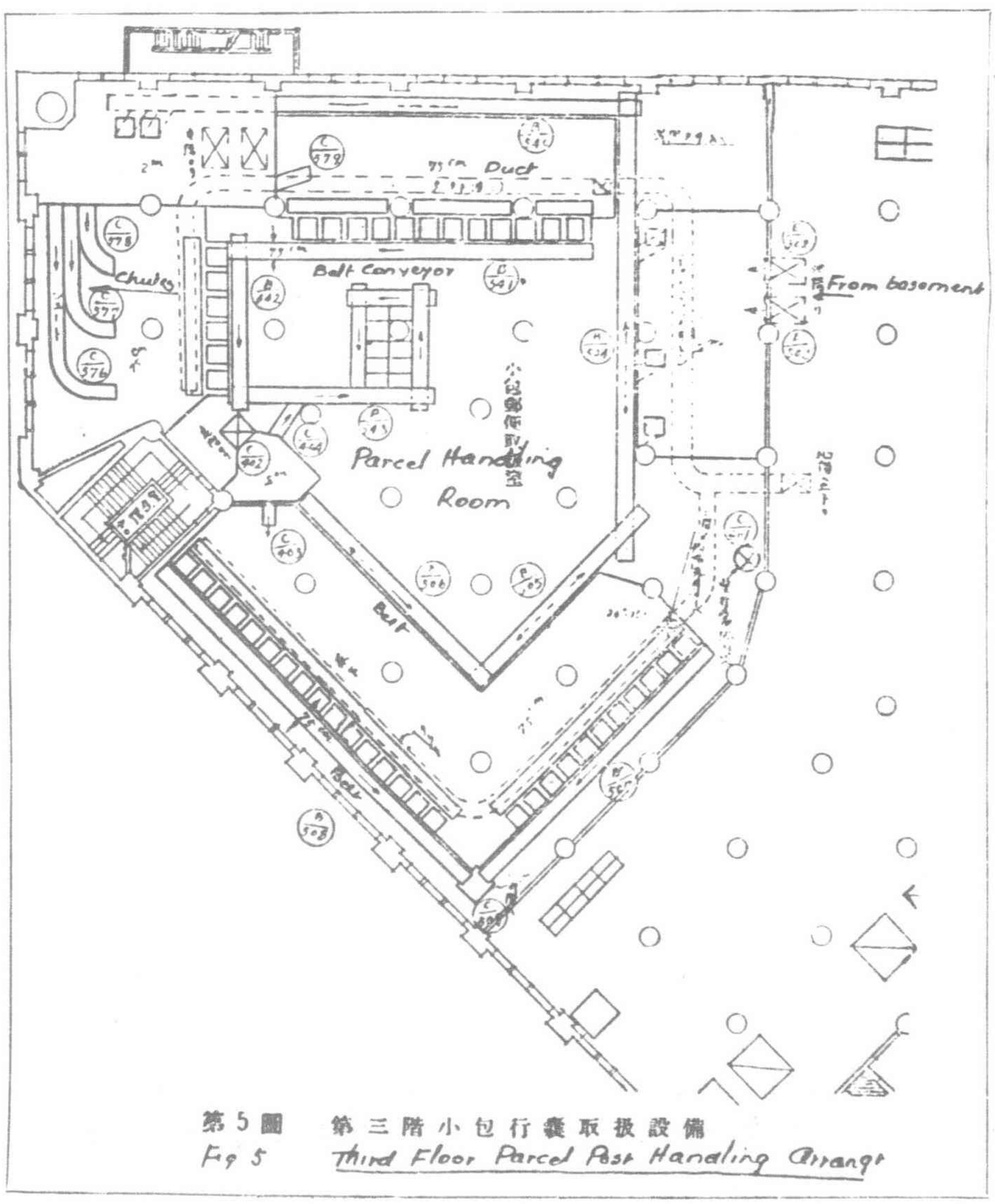
第4圖 第二階配置全景
Fig 4 Second Floor Plan

enter the plant from one corner and while moving along rectangularly with the conveyors, men standing around them select the parcels in their own charge and drop them into the proper chutes.

The parcels dropped into the eight chutes are carried by seven belt conveyors arranged underneath the ceiling of the ordinary parcel sorting room of the second floor and through fourteen chutes they are distributed to eight places, where they are sorted to proper shelves and placed in mail bags to be sent to post offices in main districts. Then, the mail bags for south-eastern districts are carried to the delivery department in the basement by belt conveyors and chutes, and are transported to Tokyo Station by underground tram-cars. The parcels for north-eastern districts are shifted to the second floor delivery department by means of a belt conveyor, chutes and a bucket elevator, and are loaded on motor lorries through delivery chutes and carried to the corresponding railway stations.

Parcels directly received at the Post Office are transferred to the collection and delivery department at the western side of the building by belt conveyors and chutes.

Special parcels are registered after opening the mail bags and transported to the general sorting plant on the second floor by means of belt conveyors and a chute. They are handled in a similar way to ordinary parcels.



第5圖 第三階小包行嚢取扱設備
Fig 5 Third Floor Parcel Post Handling Arrangt

Handling of Ordinary Post

Ordinary post is enormous in quantity, but the mechanical handling of it is very difficult owing to the abnormal variety of kind and size of envelopes and cards, particularly in Japan.

The urban and suburban mail is dealt with in the handling room on the first floor and other mail is sorted in a room on the second floor. Special pieces of mail being comparatively few in number, a room at the northern side of the second floor is allotted for this purpose.

The arrival routes are the same as those of the parcel post. The mail from the south-eastern directions arriving in the basement via Tokyo Station is carried toward the right hand side by steel belt conveyors and then to rubber belt conveyor and baggage elevator. Mail from the north-eastern areas and from Tokyo city and suburbs arriving by mail motor lorries is shifted to a belt conveyor through rail roller chutes from the southern platform and enters the mail opening department on the first floor. Ordinary mail and special or registered mail are classified by white and red bags, whilst transit mail is collected in other bags after opening in this department. One part is transported to the delivery department on the mezzanine floor by baggage elevators, and other mail to the basement delivery department through a chute or

to the sorting room through other chutes, conveyors and bucket elevators. Here again red bags are conveyed to the special mail handling room by means of the lower side belts of conveyors.

Mails received directly at the Post Office are carried to the sorting tables on the second floor through a belt conveyor or chutes, whilst mail posted in the office boxes is carried to the sorting desks on the second floor through automatic opening or shutting devices. Here the mail is classified into post cards, letters and other larger pieces, the first two being stamped and distributed to six sections through the ordinary mail general sorting plant.

The urban and suburban mail comes to the first floor sorting room by electro-posts and belt conveyors, and after being classified and placed in bags is then collected by a belt conveyor and carried to the delivery department by a bucket elevator.

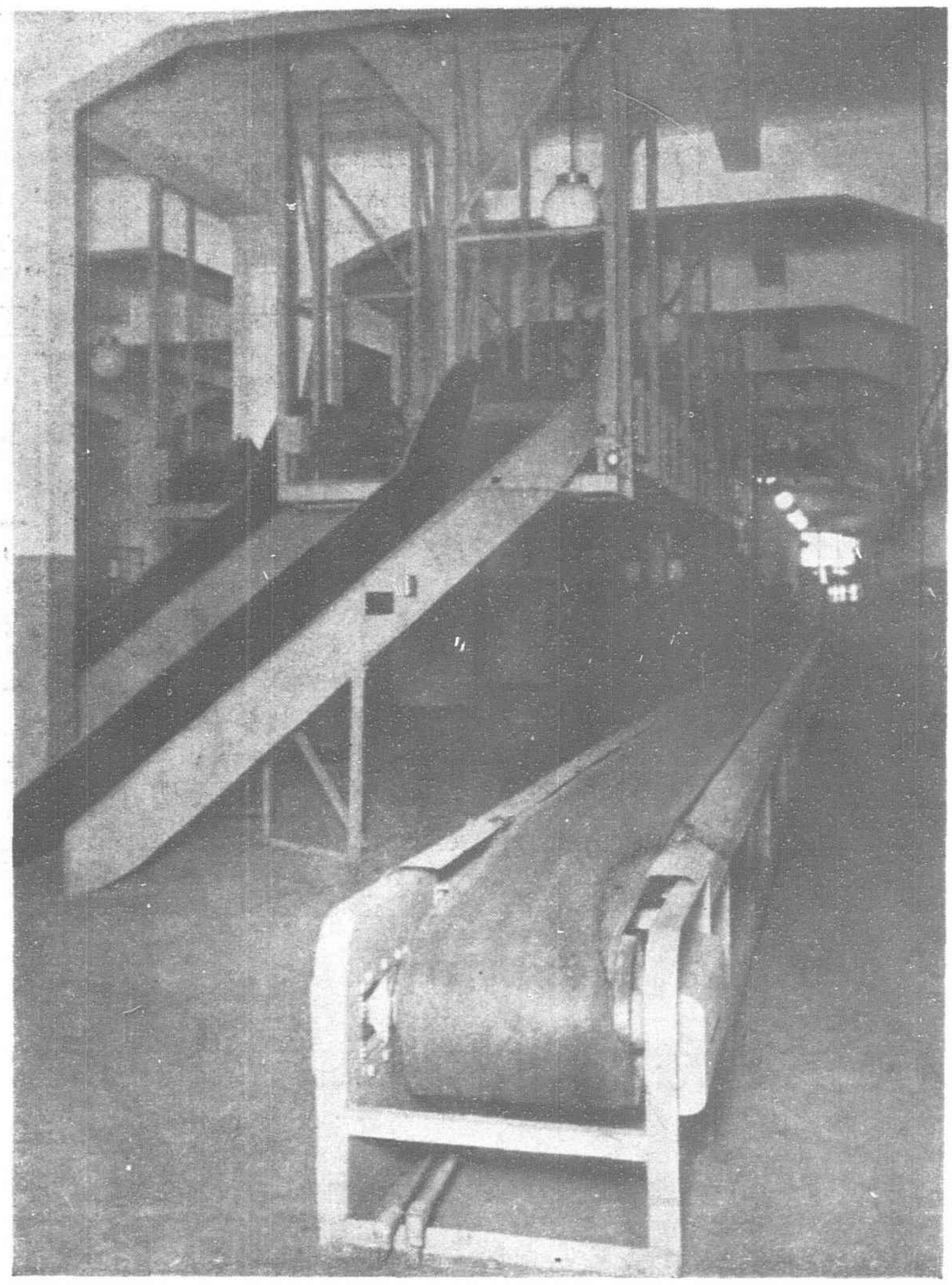
As mail delivered by the central office does not need sorting, this is forwarded direct to the first floor delivery department by electro-posts.

Handling of Foreign Mail

Foreign mail is not large in quantity and time limits are not so strict as with inland mail, so that the work is more or less intermittant and mechanical transportation is not always necessary.

The handling room is in the central part of the third floor and also custody rooms are provided on the first and second floors.

The mail arriving by the underground tram-cars is conveyed by chain conveyors to a baggage elevator and shifted to the third floor handling room. That received directly at the Post Office is carried to this room by electro-posts. The custody rooms have four shelves with steel mail cases, in which foreign mail is temporarily kept. The total number of cases is 88 and hand tractors are used for transportation, whilst the removal to and from the shelves is effected by portable lifts.



One of the rubber belt conveyors

New Year Cards.—Popular exchange of New Year cards is an outstanding characteristic in Japan, and through this happens the volume of matter is enormous only once in a year, so that independent handling rooms are arranged on the second and third floors. A special lift is provided for the purpose.

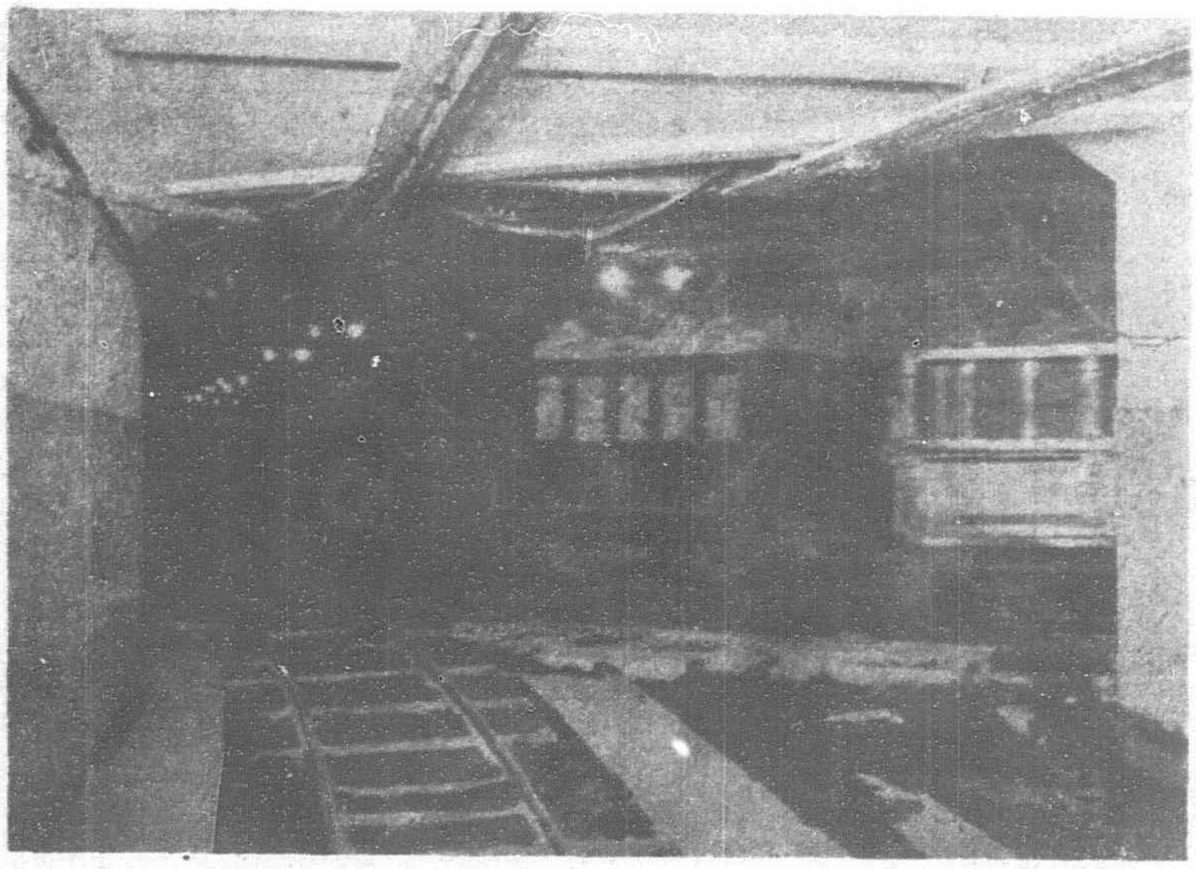
Handling of Telegrams.—The Central Post Office deals only with acceptance and delivery of telegrams, whilst the complete telegraphic business is transacted by the Central Telegraph Office. Pneumatic piping is provided between these two offices for the conveyance of telegrams and documents.

Telegram forms received at the window in the first floor of the Post Office are carried to the telegraph office on the third floor by means of hemp belt conveyors. After putting them in order in this room, they are shifted to the delivery department on the first floor by hemp conveyors and drop trunks. Between these two rooms is a lift for conveying documents and also voice tubes.

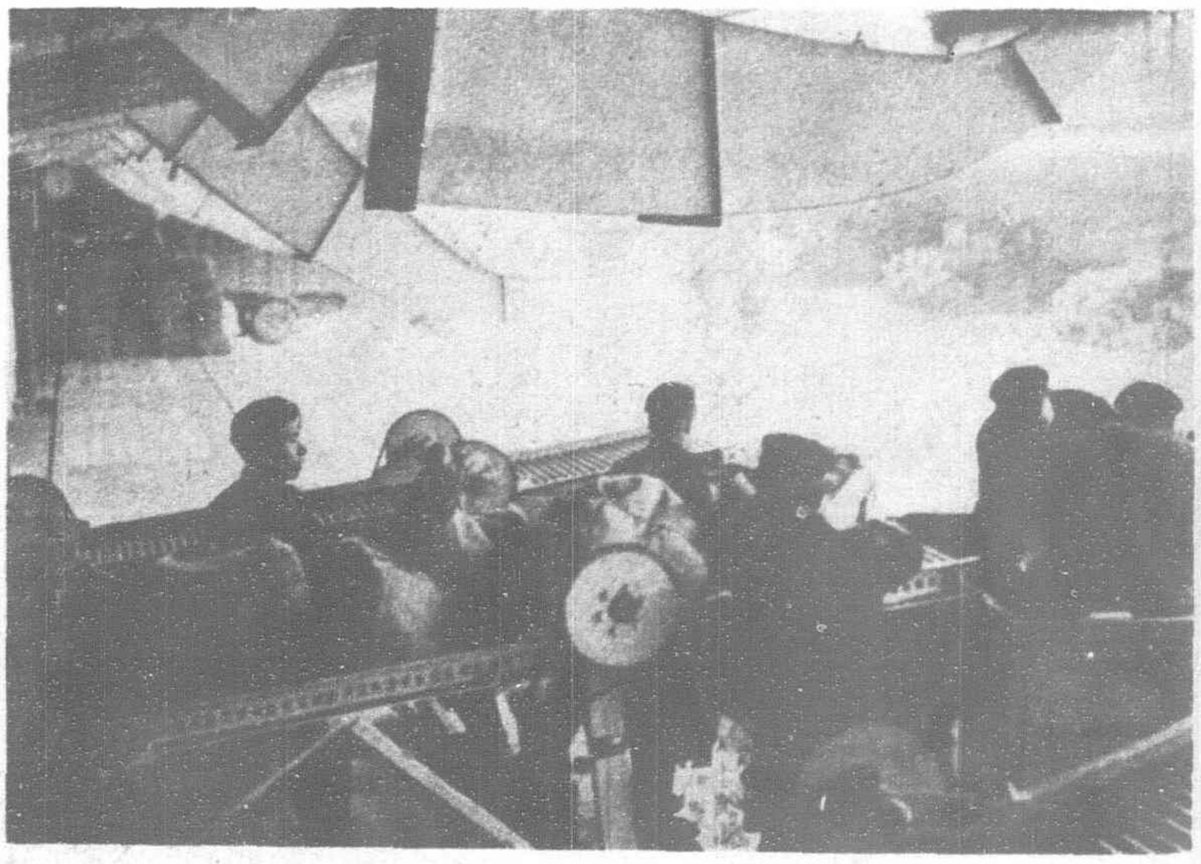
Handling of Empty Mail Bags.—Mail bags once used are repaired, washed and stored. Empty mail bags from opening rooms of all floors are dropped to the mail bag room in the basement through chutes, and are washed in the washing room after having been repaired. The bag room and the wash room are connected by a trolley conveyor. The empty bags thus repaired and washed are moved by a lift to the storage departments on the first and second floor.

Transporting Equipment

The general principle of the conveyance of mail matter in the Tokyo Central Post Office is that belt conveyors are used for horizontal transportation, and elevators, lifts and chutes for vertical direction. Simplification is another principle in the design and construction of these appliances and spare parts.



Underground Tram-cars connecting Tokyo Station with the Post Office



Mail Bags being unloaded from motor lorries on roller chutes on southern platform

The mechanical appliances are as follows :—

Kind	*Number*
Belt conveyors	69
Baggage elevators	11
Lifts (exclusive large goods lifts)	5
Trolley conveyors	1
Chain conveyors	2
Portable roller chutes	8
Chutes	77
Subveyors	3
Electro-posts	4
Automatic post	1
General mail sorting plant	1
Hand tractors	2
Portable lifts	2
Air extracting plant	1

Belt Conveyors.—Amongst the mechanical details in the Central Post Office, belt conveyors occupy the main part and the total extension is about 1,605 meters. The belts used are of steel, rubber and hemp and the widths are generally 75 cm. and 50 cm., whilst steel belts and rubber belts at the arrival position in the basement are 95 cm. wide. The hemp belts are used only for the conveyance of telegrams and have two widths, 90 cm. and 15 cm.



Public entrance hall of the New Tokyo Central Post Office

For the steel belts, hard steel plates of 1.4 mm. thick, and at the place where loads are placed a wooden sliding table is provided underneath the belt, whilst all other parts are supported by carriers with ball bearings arranged in a pitch of 975 mm. The diameter of end pullys is 1.5 meters.

The rubber belts of 75 cm. wide are in five ply and those of 50 cm. are in four ply, whilst light carriers are mainly adopted and screw type take-ups covered well with sheet iron plate are used. Both sides of the conveyors are fitted with side covers at loading places and in other parts side plates are fitted to a height of 150 mm. above the belt surface in order to prevent the dropping of articles.

The hemp belts for telegrams are of special cloth to meet the elongation and contraction due to change of temperature and at the horizontal position they slide along inside a U-shaped trough of polished steel plate and at the vertical position double belts are used in order to carry telegrams between them. Carriers are of aluminium with ball bearings.

The largest length of the conveyors is 67.8 meters, and the speed of belts is generally 60 meters per min., whilst for reading 30 meters per min. is adopted. The output of electric motors is 7.5 h.p. for the largest and $\frac{1}{4}$ h.p. for the smallest. All reduction gears are of plain toothed wheels working in oil baths and every precaution is taken for the prevention of vibration and noise.

Baggage Elevators.—For the upward transportation of mail bags, baggage elevators are used. These are arm elevators, the total number being 11 and the total height 119 meters, amongst which seven are provided with rubber belt inside of arms. The belt moves at the same speed with that of the arms so as to transport baggage without causing sliding. The widths of the arms are 95 cm. and 75 cm., and the pitch one meter, whilst at both sides roller chains are used ; the rollers turn against the rails. The take-ups are of a screw type, and for the interior rubber belt gravity take-ups are provided.

The speed of the arms in all cases is 30 meters per min. and the largest motor power is 5 h.p., the smallest 2 h.p., reduction gears being of the plain toothed wheel type the same as those of conveyors. Further, the power machines have friction clutches of a disc type which prevent damaging the machinery in case of baggage or arms being caught.

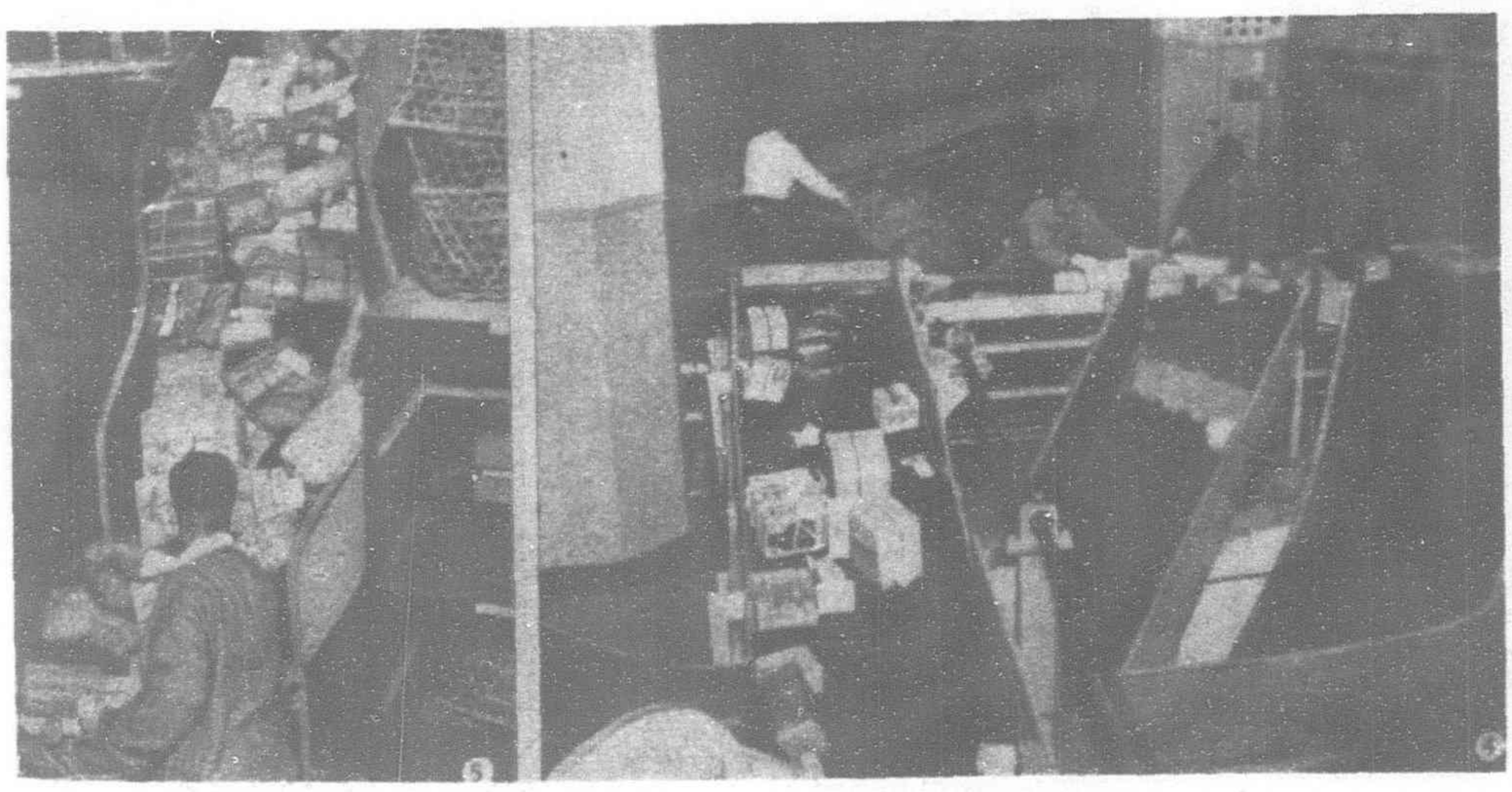
Lifts.—All lifts are of geared traction type installed in a steel tower enclosed by sheet iron plating. Cages of large lifts have dimensions 100 cm. by 120 cm. by 150 cm., the working load being 200 kg. Safety devices are provided for preventing a drop of the cage in case of broken down wires or slackened ropes. The size of the lift for special mail matter is 50 cm. by 50 cm. by 50 cm., whilst that of the telegram lift is 23 cm. by 18 cm. by 30 cm., both working for a load nine kgs. The motors are of three h.p. and $\frac{1}{2}$ h.p., all having the same lifting speed of 30 meters per min. and being operated by push buttons. At the top and bottom ends, two limit switches are provided. There is a special lift designed for the skip hoist, baggage being automatically taken through roller chute from a belt conveyor on the first floor and delivered by turning buckets at the third floor.

Trolley Conveyors.—These are used in the basement for the conveyance of empty mail bags, and the working load is 12 kg. each with a hook pitch three meters, a chain speed 20 meters per min. and driving motor power five h.p.

The rails are of I bars of 100 mm. by 75 mm. by five mm., the total length of chains is about 85 meters and is hung on the I-shaped rails by rollers at one meter spacing. At both ends of this machine are sprocket wheels of two meters in diameter, whilst at curved parts of the rails, guide wheels of one meter diam. are provided. The power plant is the same as the baggage elevator.

Chain Conveyors.—These are for pulling three wheeled carriages and two are arranged side by side. Each conveyor is for a transporting load (with a carriage) 375 kg. at 30 meters per min. and the total length is 13 meters, the electric motor being of two h.p.

The machine is installed in a ditch underneath the floor, and claws being projected above the floor, they pull three wheelers meshed with them. In order to guide the wheels of the carriage,

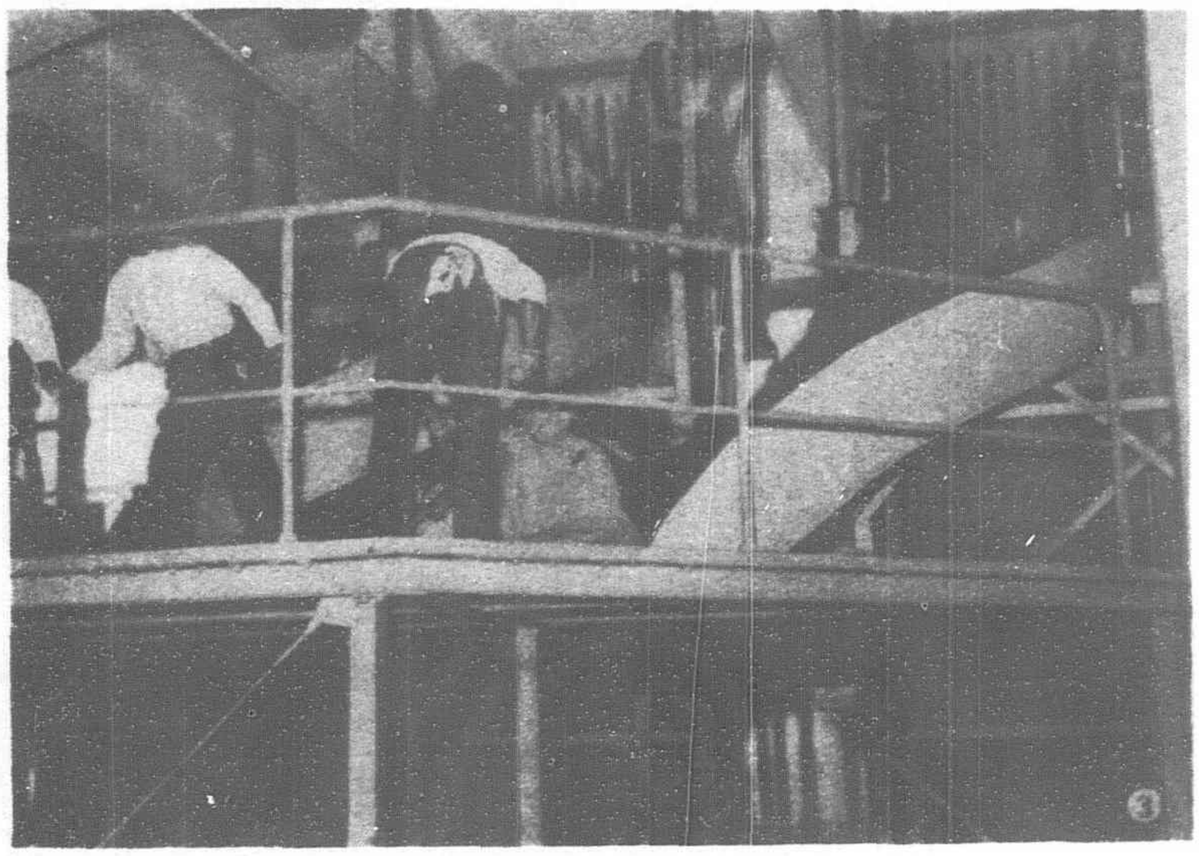


Conveyor and chutes for Parcel Post

three channel bars are fitted. The power plant is the same as that of the trolley conveyor and the machine is reversible.

Portable Rail Roller Chutes.—These running on rails five meters long have a length five meters, the width being all 75 cm. The rollers are of polished steel tubes with a diameter 40 mm., ball bearings are fitted to all axles and the roller pitch is arranged sufficiently narrow so as not to eat mail bags. These machines are foldable into three whenever required.

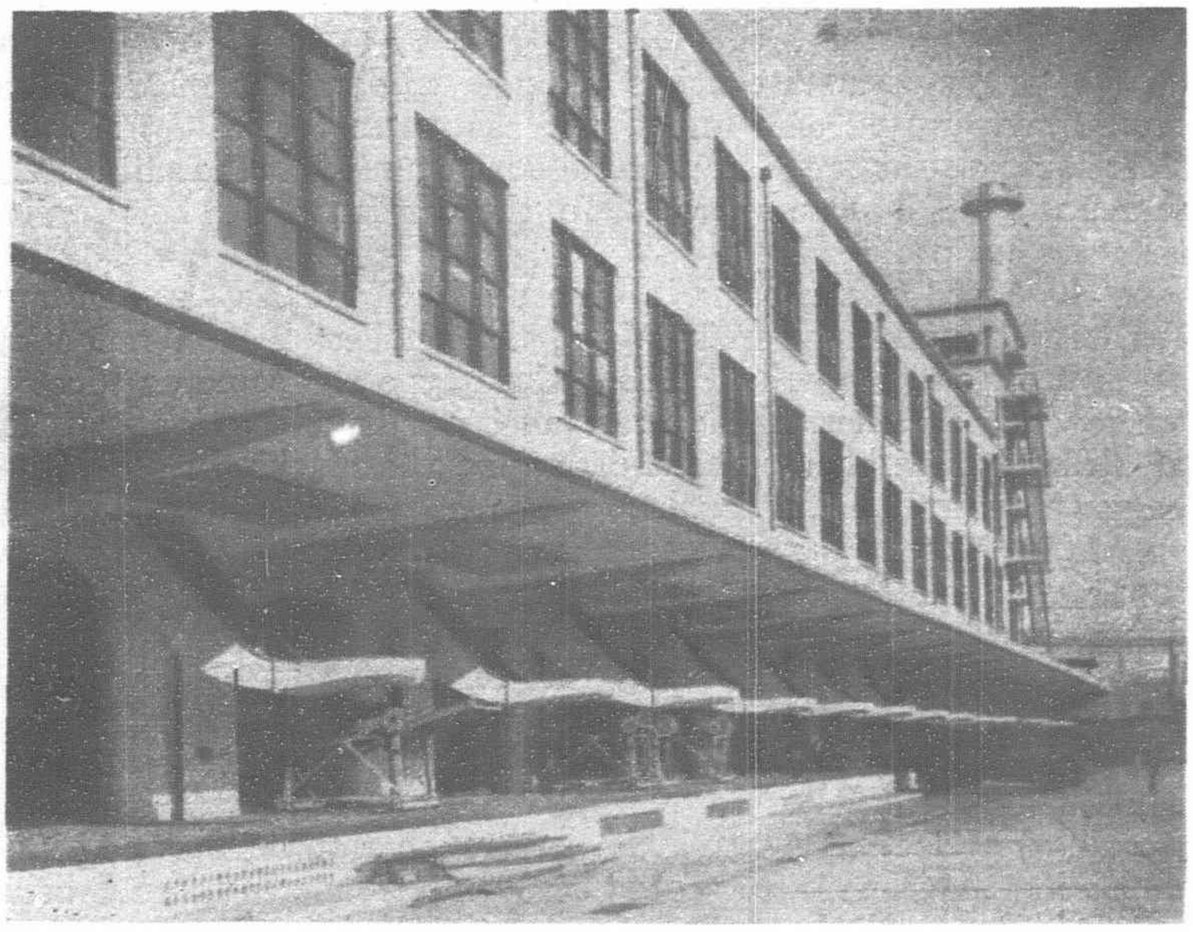
Chutes.—The majority are 85 cm. in width, whilst some are 75 cm. and 50 cm. wide. The total extended length is 500 meters,



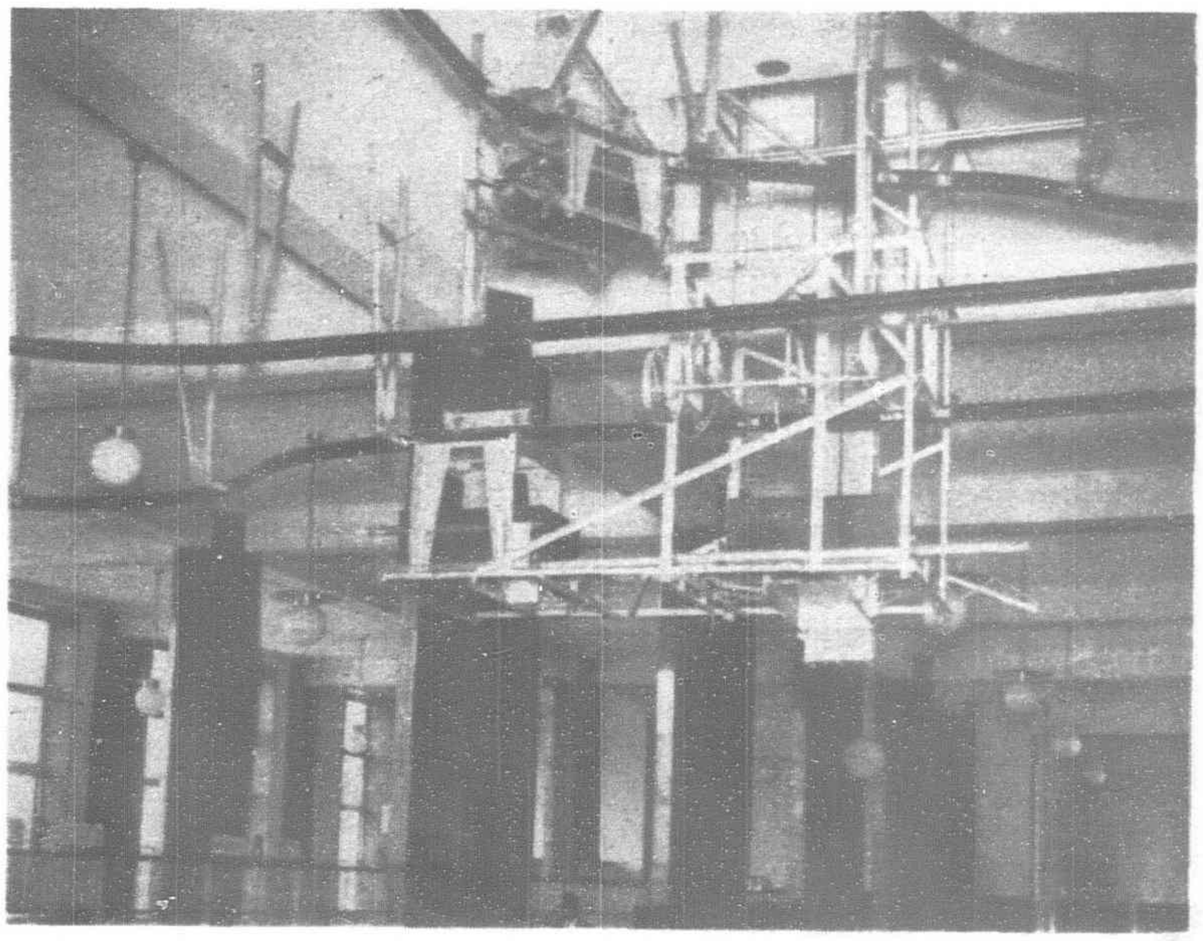
Arm elevators and mail chutes



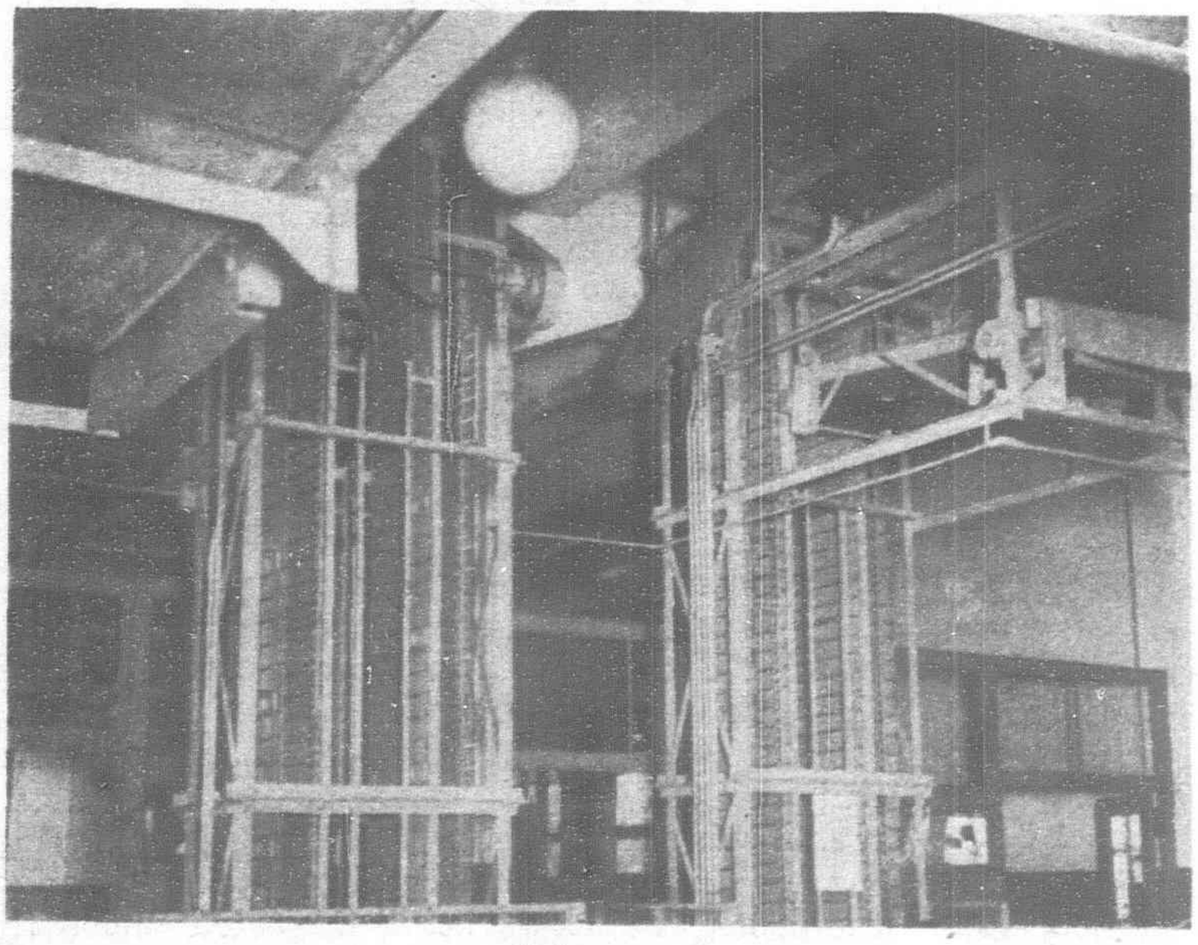
Mail bag repairing department



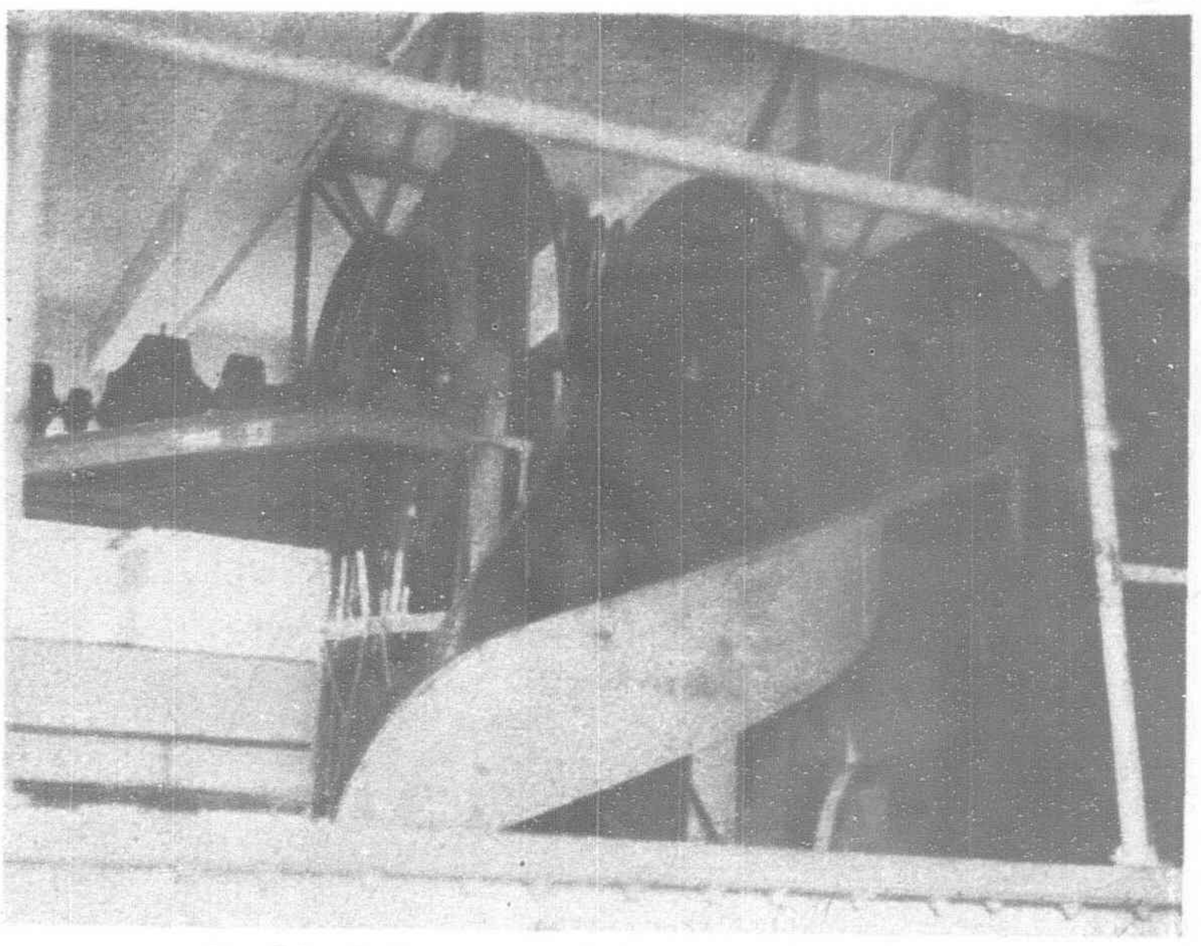
Southern side of Tokyo Post Office showing approaches for motor lorries



Electro-Posts with which Tokyo Central Post Office is equipped



Subveyors



Combined elevator and chute for parcel bags

of which about 55 meters are for roller chutes. The inclination of chutes differs in accordance with the place where they are used. Plain chutes are of 3.2 mm. steel plates, whilst roller chutes are of the same construction as portable roller chutes. Steel pipe hand rails are provided at the mouth of the chutes for protection.

Subveyors.—These are a combination of a special arm elevator and a belt conveyor, and are used for transporting mail fibre cases from the first floor to the ceiling conveyors of the second floor. The capacity is about 1,150 cases per hour, the height 10.65 meters, the pitch of trays about 50 cm., the speed 9.6 meters per min. and the electric motor power three h.p.

In these elevators, side plates are hung on endless chains at sides, and the side plates are fitted with shaped arms which are arranged symmetrically to oppose each other towards the inner surfaces of the side plates. These being driven at the same speed, the bottoms of cases are caught by them and lifted upwards. The cases conveyed by the belt conveyors at the lower parts of the elevators are loaded on them by means of automatic intermitant feeding devices, and after reaching tops are discharged on belt conveyors. Therefore, the cases are carried always level. The complete drive being effected by an electric motor fitted on the top of the elevator through a worm gear, all parts of the machine are simultaneously and uniformly driven, whilst all axles have ball or roller bearings.

Electro-posts.—These are devices to carry automatically documents and parcels from one place to another, and are a combination of a hanging railway and an elevator. Endless I-shaped rails are hung from the ceiling and on these rails one or more electric self-propelling carriages are fitted, and in several positions stations are installed, from where elevators are built upwards or downwards from the floor. The mechanism is very ingeneous operation is simply effected by push buttons.

Two kinds of electro-posts are installed in the Tokyo Central Post Office, one carrying goods of maximum size 60 cm. by 90 cm. by 60 cm. weighing 19 kg. and the other 40 cm. by 60 cm by 25 cm., 12 kg. There are only two post offices in the world, Tokyo and Berlin, where electro-posts are in use.

Automatic Posts.—This is a mechanical device carrying automatically letters, cards and the like posted in the first floor post boxes, to the second floor sorting tables. It consists of post boxes, four belt conveyors and one elevator. Mail matter posted in two boxes at entrances is first conveyed to a large post box in the basement by a belt conveyor, and in the bottom of this box is a short belt conveyor which automatically feeds the contents to the next conveyor at a constant time interval or when the weight of the contents reaches six kg., and starting successively conveyors and elevators connected with it the articles are carried to the sorting tables on the second floor. The belt conveyors have a width of 60 cm., running inside of U-tube trough, whilst the passages for the mail matter are totally enclosed, so that there is no fear of the loss of articles.

These devices can also be started at any time by a push button at the sorting tables.

Ordinary Mail General Sorting Plant.—This is an installation for classifying post cards and letters into six main destinations. There are eighteen sets of sorting shelve sections each with six throw holes, controlled by eighteen men.

Inside each shelf there is a cotton cloth conveyor of 15 cm. wide and 22.5 cm. long, making 108 in total number, running at 100 meters per min. Postal matter thrown into the boxes is delivered backwards by these small conveyors and is fed to belt conveyors behind them which comprise six cotton belts of 16 meter long and 25 cm. wide, three of them running in opposite directions and then the articles are placed in six cases.

These installations being totally enclosed by sheet iron plates, the mail is prevented from being scattered. Three sets of $\frac{1}{4}$ h.p. and one two h.p. electric motors are used.

Air Exhaust Plant.—An air exhausting plant at the mail bag opening department of the third floor comprises a multi-vane exhaust fan, an air purifier, a pump and a purifying water tank. The fan has a capacity of 570 litres per min. at a speed of 850 meters per min., vane wheel diameter being 915 mm., static pressure 64 mm., revolutions 492 per min. This is driven by a 15 h.p. electric motor through V type ropes.

The air purifier is for washing air through running water, and the pump is of a horizontal centrifugal type with a bore 25 mm., a capacity 57 litres per min. at a head of 5.4 meters. The driving motor is of 11 h.p.

Electric Motors.—All electric motors used in the mechanical installations of the Tokyo Central Post Office are of enclosed ventilated double cage type three phase A.C. induction motors at 200-volts 50-cycles, the total number being 96 and the total output $245\frac{3}{4}$ h.p.

The writer is much indebted to Professor S. Noguti of Tokyo Imperial University and Messrs. Hitachi Engineering Works for information relating to the mechanical equipment of the Tokyo Central Post Office and for photographs.

Nickel Found in Chosen

A vast nickel ore deposit which compares favorably with the best in the world as far as percentage of purity is concerned has recently been discovered in a corner of northern Chosen. The discovery was made by Mr. Mutsuyuki Nakamura, director of the Nippon Chemical research institute at Tsukuda-cho, Nishi Yodogawaku, Osaka.

Mr. Saburi of the Osaka mine superintendence bureau, upon assaying sample ore submitted by Mr. Nakamura, disclosed the fact that it contained from 2.51 to 3 per cent of nickel, which is considered about as high a percentage of nickel content as found anywhere.

The complete analysis of the sample ore shows that it contains, aside from nickel, 50 to 60 per cent of iron, 0.22 to 1 per cent of copper, 0.36 to 0.5 per cent of cobalt, and 37 per cent of sulphur.

So favorably impressed with sample ore was he, that the bureau assayor called Mr. Nakamura, the director of the chemical institute, and Mr. Matsuo, the assistant who aided his chief in the prospecting, from whom be heard the details of the deposit.

According to the prospectors, the nickel deposit covers an area of approximately 16,537,500 acres around Kodoko, Tansen-gun, Kankyo Nando, Chosen. The nickel veins are mostly enveloped in limestone and are very easy to mine, since the greater portion of the nickel containing strata are exposed.

Mr. Nakamura and his associates have yet to explore the adjoining country, and when they do so they may tap additional nickel deposits. Precisely as in the case of the Sadbury nickel mine in Canada, supplier of 90 per cent of the world's nickel, the recently discovered nickel ores are said to require very little smelting.

Mr. Nakamura and his associates expect to start actual operation of the mine immediately after the thaw next spring. The mine is located at a point that can be reached by a half day motor trip from Joshin harbor, which means that ore can be shipped with ridiculous ease to Osaka for refining.

Tunnel to Replace Ferry

The old fashioned and slow moving ferry service across the Ajikawa, about three miles above the mouth at Gembei, will be supplanted by a spacious Y.1,000,000 submarine highway tunnel beneath the riverbed about 18 months from now. The Osaka municipal civil engineering bureau is drafting plans and specifications and will embark on the construction work during the middle of December.

This submarine tunnel has been conceived by municipal engineers as the logical solution of the trans-Ajikawa traffic, which has for ages been carried by ferry boats. Although bascule and draw bridges were suggested from time to time they failed to convince the municipal authorities that they were the ideal medium, for the reason that approximately 2,000 craft of all sizes, including a great many 1,000 tonners, go up and down the river.

The main bore beneath the riverbed will be 80 meters long, and with the approaches to the riverbanks, the tunned will have a total length of 130 7 meters. When the subterranean inclines from both sides are added, the entire length of the subway will extend 933.2 meters.

How the Yellow River Bridge on the Kinhan Railway Was Saved*

By JICK G. WONG, Chief Engineer, Peiping-Hankow Railway

JUST as the Yangtze River overflowed its banks with the highest water level known two years ago the Yellow River filled us with awe this summer with its worst flood. The Yellow River Bridge was shaken at its very foundations and was at the point of collapsing. It was saved only after days and nights of hard work and effective measures. Since this bridge plays such an important part not only in the Peiping-Hankow Railway but also in the middle section of China it will be interesting to record here the damage done by this flood and the urgent need to strengthen and protect the existing bridge from the danger of another flood in the future.

The Yellow River Bridge was started in June, 1903, and completed in May, 1906, but the ceremony of opening for traffic was held in October, 1905. The work was undertaken by the Campagnie d'Etude Franco-Belge and it cost $2,650,000 Mex. being guaranteed for fifteen years only. From the beginning of construction it was considered as a temporary bridge and a sinking fund was started toward its replacement a few years after its completion but most unfortunately the fund was shifted for some other use by the Northern Government. That is why when tenders were opened in 1921 for a new bridge there was no money to carry out the work. Consequently for many years this bridge has been in a precarious position. Every year steps are taken to safeguard it against the rising water in the rainy seasons. Now the speed of running trains across the bridge has also been cut down to 10 kilometers per hour, until twenty minutes are required to cross the entire bridge.

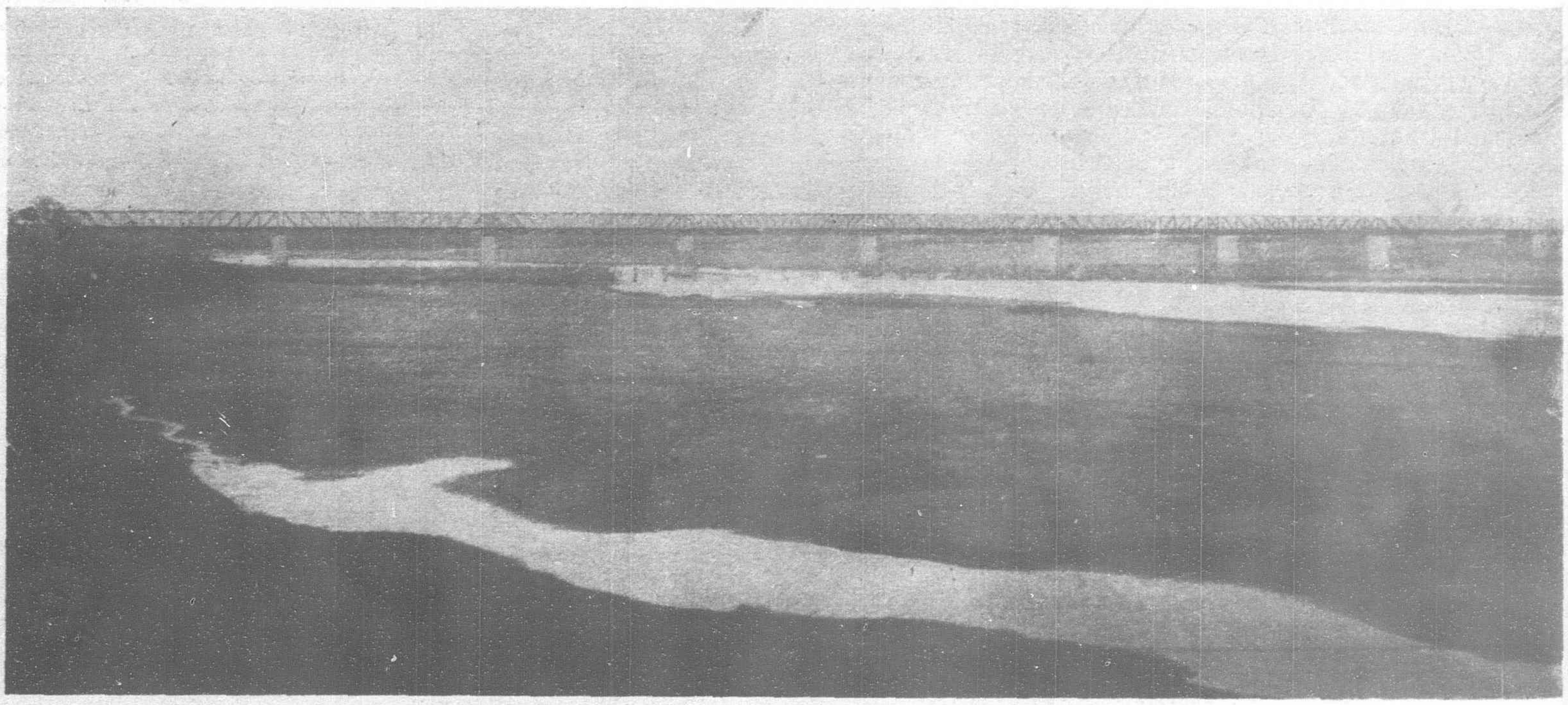
The bridge was originally built with 102 spans and over 3,000 m. long, but at present it is only 2,936 meters between abutment faces, two spans at the north end having been filled in. Span No. 102 was destroyed in the civil war of 1925 and was filled in. Spans No. 93 and 47 were also destroyed in the civil war of 1929, so span No. 101 was used for replacing No. 93, and span No. 101 was filled in, leaving only 100 spans as follows: 24 by 31.3 m. Pony Trusses at each end and 52 by 21.1 m. Deck Girders in the middle. It is of single track. The top of the rail is elevation 90.45 m. and the channel varies from about 81 m. to 83.5 m. elevation. The bridge is of a novel design in having screw piles for piers. The screw piles are of two meters length sections bolted together and the inside was filled with concrete; the average depth of these screw piles is 14.5 meters below river bed. The total tonnage of steel in the present bridge is about 4,400 tons.

The water in the Yellow River was steadily rising until July 8, when it reached a mark of 75.20 m. elevation which was only 0.2 m. lower than the previous known high level. From that date special caution was taken to safeguard the bridge. Men were stationed on the piers to clear all floating obstacles. Constant soundings were made to ascertain if there were any scouring and the alignment and levels of the bridge were watched to note if there were any sign of movement. It was noted that when the water was high there was scouring only of about 3.5 m. probably due to the fact that the depth of the water had broken the force of the currents and whirlpools before they reached the bottom. Up to August 8, there was only light fluctuation in the water level, then on August 9, the water rose to a new mark at 85.63 m. On the following day there was a sudden rise of 1.57 m., breaking all records and establishing a new mark at 87.2 m. which is likely to stand for many years to come, or may never be equalled again. It was fortunate that the bridge was not washed away because on August 11, the water suddenly dropped to 84.85 m. a drop of 2.35 m. within 24 hours. Most likely this sudden drop was caused by the breaking of the dykes downstream. The scour had also gone down to about 6.5 m.

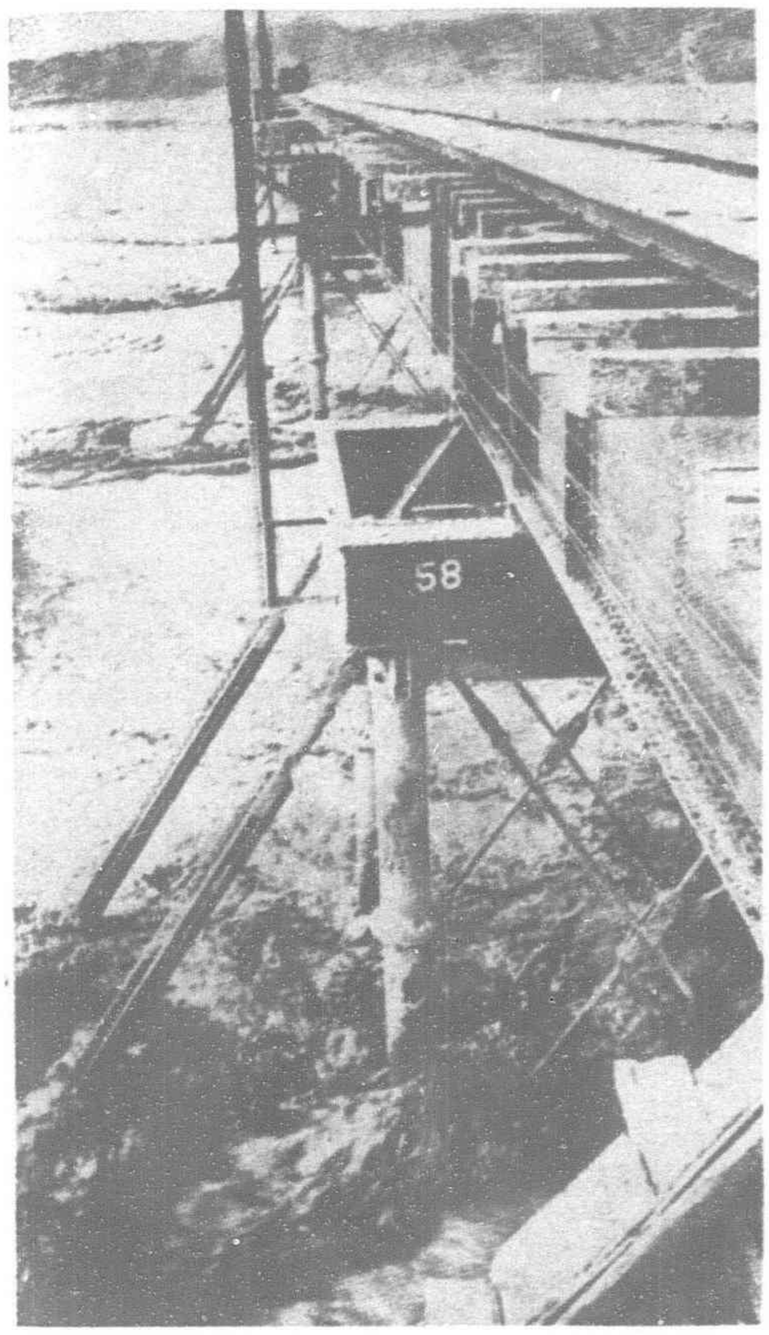
Besides the above mentioned dangers the natives living west of the Railway cut open the embankment between Chantien and the north abutment at nine points, the cuts varying from 5 m. to 10 m. in length, to let the water through and thus lessen the pressure on the main dyke running through Chantien, which is about seven meters lower than the channel of the Yellow River. This cutting of the embankment is an annual incident along the whole line wherever and whenever the water is high and threatening. But usually the water subsides within a day or two at most and then the cuts are quickly refilled to resume traffic. At such times it is impossible to prevent the natives from cutting the embankment as they come out armed and in large numbers and will even kill anyone who might try to oppose them.

In view of this unprecedented situation and the great danger from further scouring all traffic across the bridge was suspended on August 10, and steps were taken to effect repairing. But while

*Journal of the Association of Chinese and American Engineers.



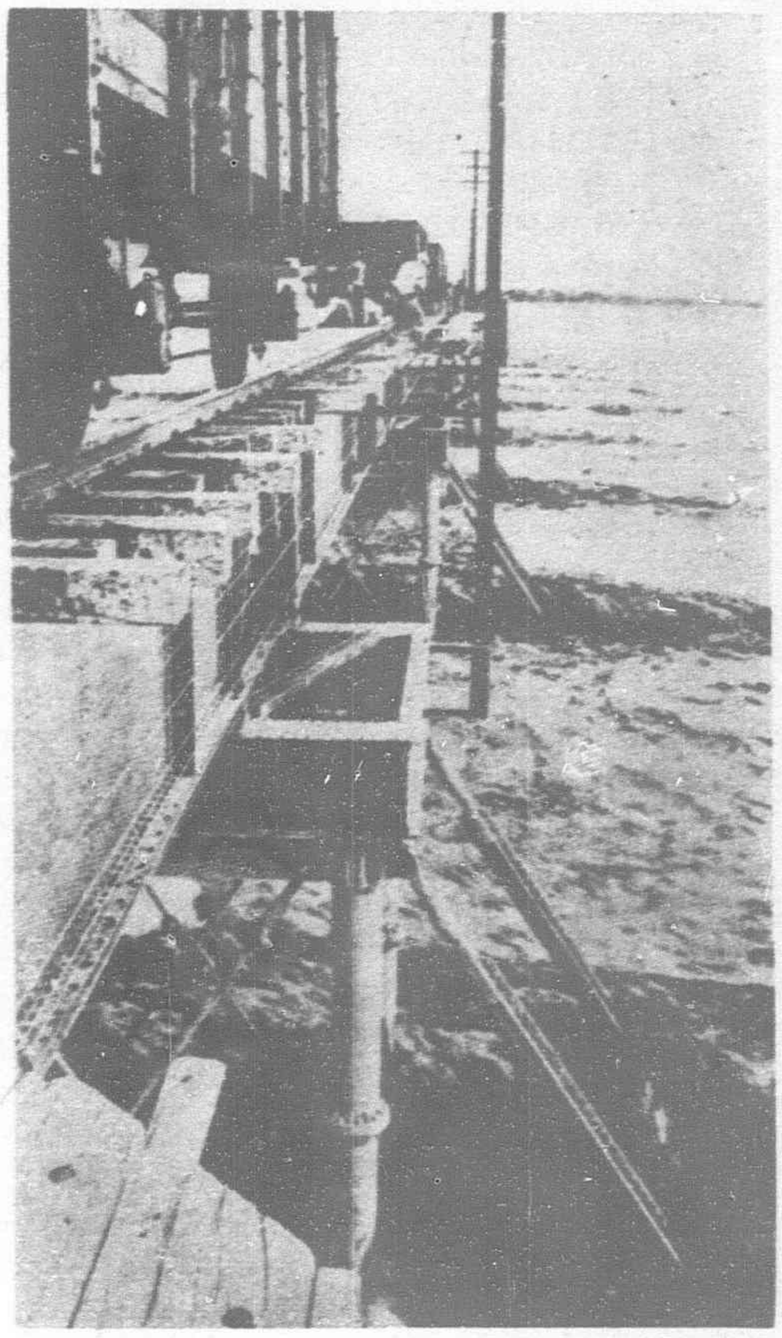
The Yellow River Bridge on the Peiping-Hankow Railway



Looking south from No. 58 span



Looking north from No. 75 span. Pier 78 shifted about 20 cm.



Looking north from span No. 58

rubble was being thrown in to fill the holes caused by scouring around the piers and preparations were being made to fill the nine gaps in the embankment a downstream movement of the No. 78 pier was noticed at 4 a.m. on August 11. The pier had shifted bodily downstream about 20 cm. without tilting and a sharp curve was formed in the track which can be seen from accompanying photograph. Stones were at once rushed to the spot and after several carloads had been thrown in the movement of the pier was stopped. But the bridge from piers No. 63 to No. 78 was swaying and shaking, showing that the scouring had affected all these piers. On August 12, pier No. 61 also showed movement, having been shifted downstream about 10 cm. and the scouring here was the greatest, being about 12 meters below the river bed. As the piles extended only about 14.5 m. below the river bed it is easily seen how endangered this pier was and how close to being swept away. On that day men were placed on the piers ready to cut any span in case of emergency in order to save the adjacent spans. On August 14, after many men had been working like Trojans day and night and about 3,000 cubic meters of rubble had been thrown in for partially filling the holes the piers began to be more steady. Danger appeared averted, providing there should be no new sudden flood.

It was very fortunate that during the worst stage when the scouring was about eight to nine meters deep and the piles were all exposed like so many stilts the joints in the piles all held fast without breaking of the bolts.

In the meantime as the water level was descending it was observed that the southern half of the bridge was silted up and the channel was greatly reduced so that water was flowing only through spans No. 60 to No. 90. This had serious effect on the piers in that channel for the currents became stronger and the scouring more severe. It was out of question to dig open the silted channel for the work of thousands of men would have been required to make it effective, as a large sand bank had been formed from the south bank up to about span No. 60 and this sand bank extended in the channel upstream for a distance of about 10 kilometers. This river has always been treacherous and sand islands are formed and washed away hourly. This fine-grained sand can separate quickly and float like thick paste. Sand islands will form at any obstacle where the currents are slow.

On August 14, all the nine gaps in the embankment were filled up so that with the piers more steady the passenger cars of the Special Express No. 1 and No. 2 were permitted to be pushed across the bridge between piers No. 50 and No. 90, the regular engines being allowed to go as far as pier No. 50 from the south and as far as No. 90 from the north. By August 19, the water level had dropped to 82.35 m. which was a record low water mark, so that in this case both the high and the low water mark were passed. As the piers became more steady after the throwing in of stones continuously day and night, a small engine was used to haul a train of 14 wagons loaded with stones across the bridge for trial. It was found that the piers showed no sign of further movement so on August 19, all the through passenger trains No. 1, No. 2, No. 11 and No. 12, were restored to traffic using a small engine to cross the bridge. On August 24 the local passenger trains between Chengchow and Shih Kia Chwang, the No. 81 and No. 82 were also run using a small engine, thus making all passenger trains restored to traffic. On August 27, the bridge was tested with the large engine and found satisfactory so all trains were restored and traffic became normal.

About 20,000 cubic meters of rubble needed to fill was asked from other railways. The Peiping Railway supplied 28 the holes. The Tientsin-Pukow Railway supplied 491 cubic meters while the Lung Hai Railway sent 700 cubic meters. In all 82 trains loads of rubble were supplied totaling 1,501 wagons and besides 370 wagon loads from our own supply at the bridge site were used, all adding up to about 20,000 cubic meters. After 17 days of day and night work only $7,440 had been spent for the labor in loading, unloading and throwing in the rubble. The cost of the rubble is from $0.78 to $1.05 per cubic meter, so that a total of about $27,000 had been spent in saving the bridge, and the traffic was entirely suspended at the bridge for only four days.

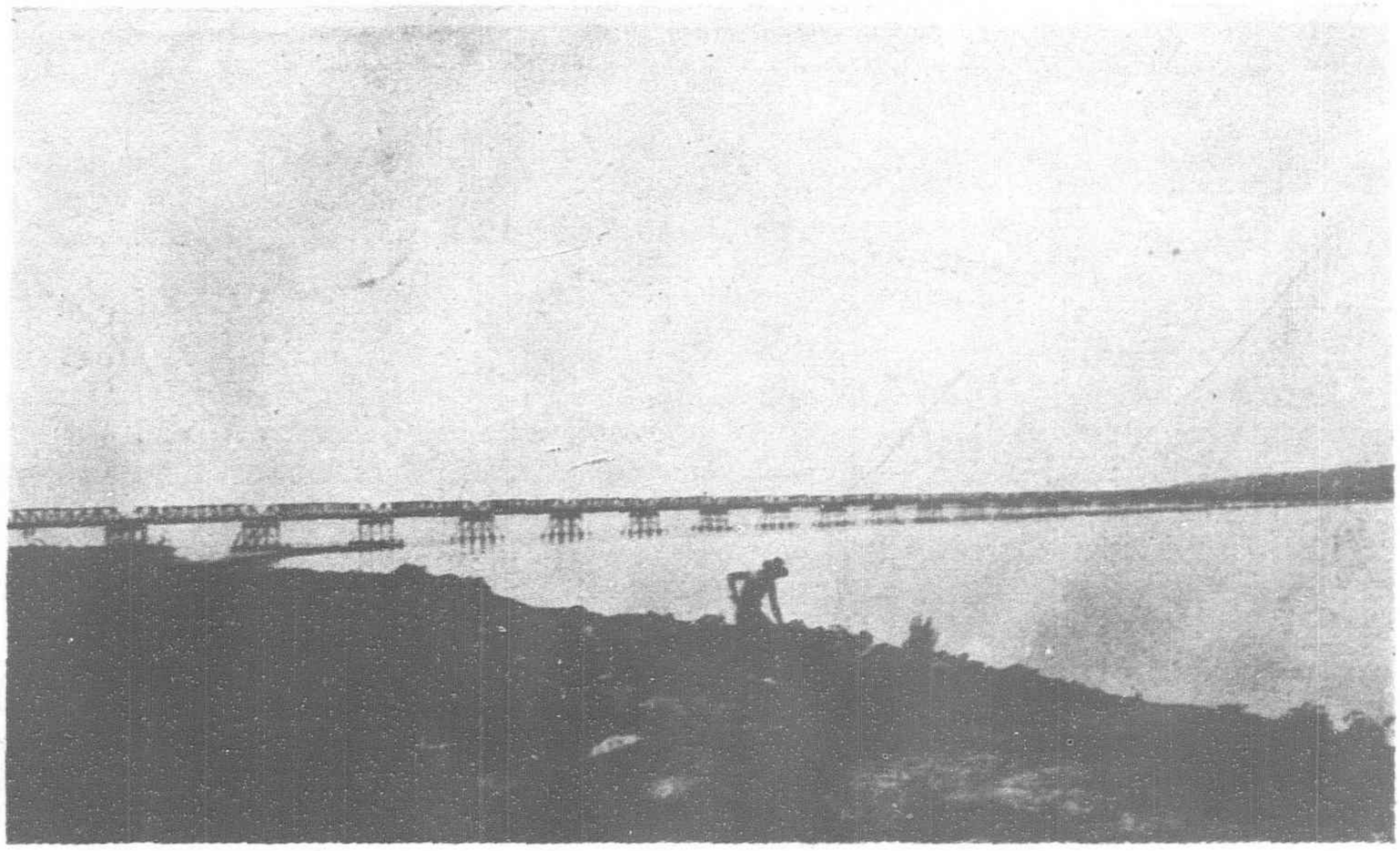
Although normal traffic has been resumed the factor of safety for the bridge is far from being sufficient. The piers all appear to be steady, the holes caused by scouring having been filled up, the water level having gone down and the currents being back to normal state. But making proper protection to the piers to give the bridge a sufficient factor of safety is imperative. Four schemes have been proposed as follows :—

(1) To use about 40,000 cubic meters of rubble to surround the piers to a thickness of three meters. This is the cheapest, easiest and requires the minimum expenditure, about $48,000 Mex. Moreover this is the old method used since construction of the bridge.

(2) To surround the piers with rings of steel sheet piles of 9 m. length, filling in the piles with stone and placing outside large stones bound together with wire netting. This is the most expensive way but the surest way to prevent scouring. The cost is about $1,459,245 Mex.
(3) To use wire netting for all stone riprap, binding the stones into bundles of about 300 kg. each. Cost about $206,300 Mex.
(4) To use additional piles four for each pier and have same laced and bolted together with the old piles forming a truss-like structure so that if any of the old piles get loose the weight can be carried by the additional piles which are to be of about 22 m. deep. Also stones with wire netting are to be used. Cost about $457,000 Mex.

Of the above four methods the first is the simplest and cheapest, but each year some stones have to be added, depending upon the amount washed away. The work has to be done in dry season to be more effective. However this is the minimum requirement and pending further instructions from the Ministry of Railways is the method which must be used.

From the economic standpoint concerning the railway it seems that to use the simple method of protecting the piers with riprap, is sufficient, but since this bridge plays such an important part in the welfare of the people in central China and as it is so important to the government for strategic reasons more serious thought should be given to the renewal of this bridge which has served far beyond its expected term. As far as the steel superstructure is concerned the bridge is still in very good condition but the piers are rather doubtful, and will always remain a source of anxiety to the Authorities. In case another flood should occur the bridge might be washed away with loss immeasurable in terms of usefulness to the nation. With this view in mind it is recommended that a new bridge be built and the old one be kept for a highway crossing. A new bridge using short spans of about 40 to 50 meter Deck Trusses with foundations about 25 to 30 m. below the river bed would cost about $8,000,000 Mex. With foundations at 25 to 30 m. below the river bed all danger from scouring would be eliminated. The short spans are the best for they can be easily replaced in case of emergency and also probably the cheapest type as the foundation soil is the same throughout.



Another general view of the Yellow River Bridge of the Kinhan Line from the North Bank

In 1921 when tenders were opened for a new bridge, after competition award was made to the Societé d'Etudes et de Construction, Societé Belge de Chemins de fer en Chine and Compagnie General de Chemins de fer et de Tramways en Chine. The cost was to be $10,881,600 Mex. The spans were to be 40 by 67.5 m. plus 2 by 12.5 m. at each end, total tonnage of steel bridges being about 10,423 tons.

It is to be noted that the special Commission which had spent a lot of time in studying this bridge did not recommend the reduction of the length of the new bridge as is the practice on bridges in India because the existence of the present bridge made the design and the construction of the proper training walls difficult and complicated. Mr. John R. Freeman, the American Hydraulic Engineer who was Adviser to the Grand Canal Commission expressed the opinion that the bridge could be narrowed down to about one-quarter of the present length due to the fact that in one section downstream there is a narrow channel only about 260 meters wide. However, from years of observation since the completion of the old bridge the men in the field all dispute this idea of such great reduction of the channel. In any case it will be impossible to carry out any great reduction of the channel width for the natives on the upper stream will certainly oppose any such plan even with their lives.

Due to the sand forming a barrier extending out from the south bank the currents are stronger and the water strikes the north bank at an angle about 1.7 kilometers upstream, then it is deflected and when it reaches the bridge is flowing in a direction from north-west to south-east and striking the piers at an angle of about 30 degrees. The intensity of the flow can be gauged by the fact when the currents strike the piers there is a sharp drop of about two feet like a waterfall, as seen from the accompanying picture. This is perhaps the greatest cause of the scouring. Measurement of the flow showed that the velocity was from about one meter to 2.5 meters per second.

During the high water the north bank was overflowed and the water reached to the main dyke at Chantien. When the water receded it left silt about one meter deep so that the branch line along the north bank was entirely covered and all native houses which had not collapsed were half buried. The whole village of mud houses at the north abutment was washed away including our station building which was a rented native house. The above mentioned branch line is 16 kilometers in length especially laid to transport stones for the north bank protection. Last year this branch line was extended four kilometers to reach Nan Chia Chai on the Sin Ho and the railway donated 10,000 cubic meters of rubble to that village for the Sin Ho bank protection. After the flood the water began to undermine the north bank as the riprapping was entirely washed away. At a point 1.7 kilometers upstream from the bridge the undermining was exceedingly rapid and dangerous: 3,000 cubic meters of rubble were immediately shifted from the bridge supply and dumped at the threatened point thus stopping the cutting away of the bank. It is estimated that a total of about 60,000 cubic meters of rubble will be required to protect properly the north bank for a distance of about 11 kilometers and as this work will be beneficial not only to this railway but also to the Tao Ching Railway and the northern part of Honan province the Provincial Government has been invited to share the expense of the north bank protection which will amount to about $72,000. If this water cuts its way through to Chantien the whole course of the river will change, leaving the present channel high and dry and the water will cross the Tao Ching Railway and reach as far north as 552 kilometers, a distance of 112 kilometers from the north bank as the land slopes downward toward the north.

During the time of high water and strong currents the drift composed of weeds, grass and timber from wrecked boats, and houses was caught and held fast on the piers and removal required the strenuous efforts of a large crew of men working in a dangerous position above the currents. Fortunately no one was hurt. The work of removing the drifts required sawing, or cutting with axes as the debris was very tightly packed and wrapped around the thin piles in thick layers and as fast as one layer was removed another was formed.

It is interesting to note that Pier No. 71 which was shifted and tilted by the flood in 1910 remained unmoved this time although the heavy concrete block used for anchoring this pier was washed away entirely. This pier was out of plumb so that tilting could be seen with the naked eye, yet it held in this year's flood even after the anchorage was washed away. Special inspection is

(Continued on page 46)

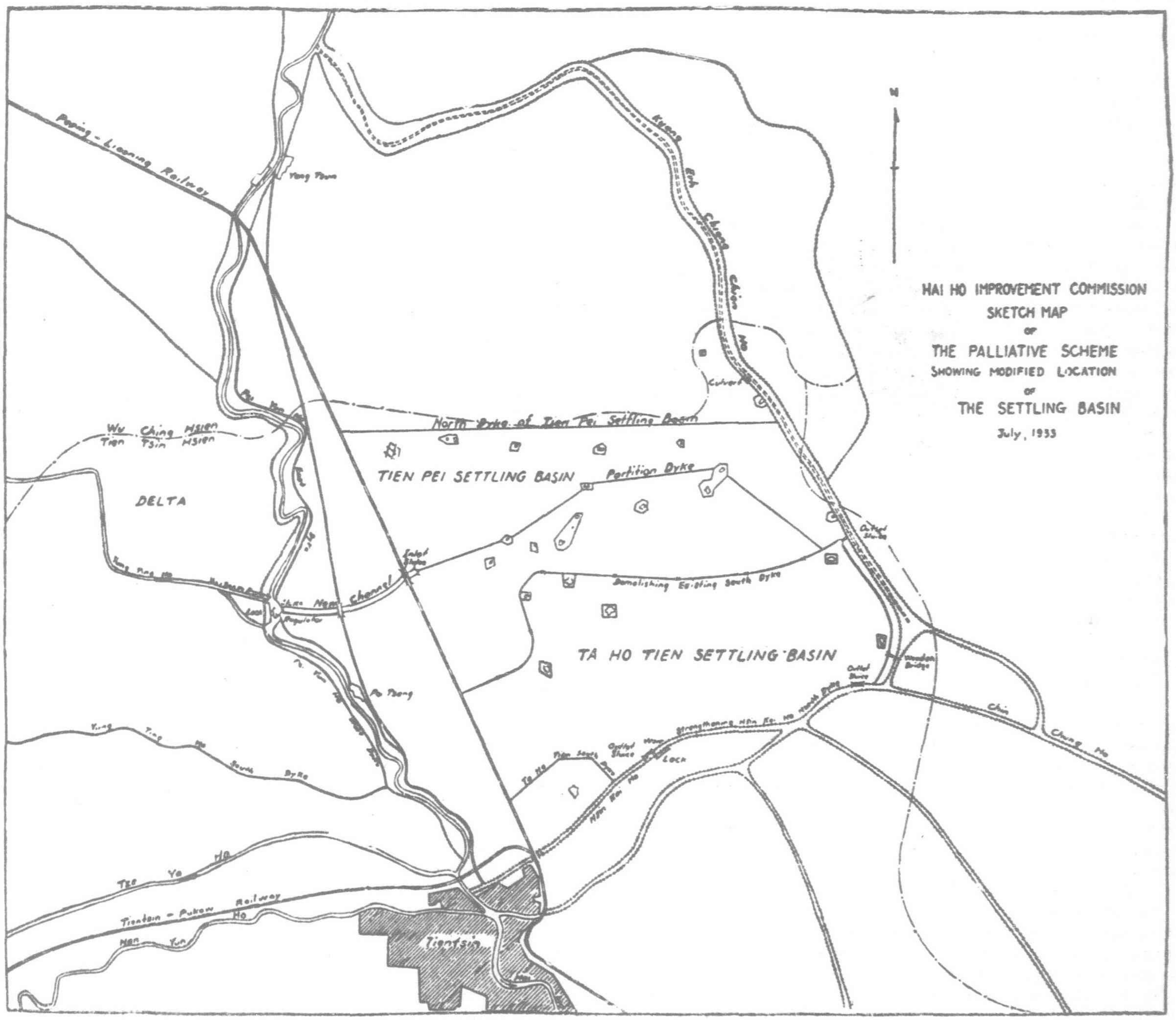
The Operation of the Hai Ho Palliative Scheme in the Summer of 1933*

By C. Y. KAO, Chief Engineer, Hai Ho Improvement Commission

THE Yung Ting Ho summer freshet commenced exceptionally early in 1933. On June 12, the water level of the Yung Ting Ho at Marco Polo Bridge began to rise above 61 m. T..D,† and on June 15, the silt percentage of the combined flow of the Yung Ting Ho and the Pei Yun Ho at Chu Chia Tien exceeded two per cent by weight. Unfortunately, at the diversion of the spring freshet in March, 1933, opposition was raised by the farmers in the Settling Basin against being flooded twice a year. After a lengthy discussion an agreement was reached between the Hai Ho Improvement Commission and the farmers that the summer freshet should not be diverted into the Settling Basin until after the Summer Solstice, by which time the wheat would be harvested so as to enable the farmers to gather their crops before the influx of water.

According to the 30-year record kept by the Hai Ho Conservancy Commission, no summer freshet of any appreciable magnitude had ever occurred before the end of June in any year, so the summer freshet of 1933 was unexpected. The Executive Committee in charge of the operation of the Hai Ho Palliative Scheme works reported the grave situation to Governor Yu, Chairman of the Hai Ho Improvement Commission, and requested the authorization for an early diversion of the muddy waters of the Yung Ting Ho. Due to this sudden inrush of silt into the Hai Ho, the bed of the river was shoaled badly so that sea-going steamers drawing more than 10 feet could hardly enter the harbor of Tientsin. It was finally decided that an early diversion of the Yung Ting Ho summer freshet should be effected immediately, on condition that the water diverted into the Settling Basin should not occupy more than the area flooded in the spring and thereby already compensated. The remaining area would not be available until after the Summer Solstice. At 8 o'clock on the morning of June 17, the sluice gates at the head of the New Leading Channel were opened and the regulator gates across the Pei Yun Ho were closed. On June 22,

*Journal of the Association of Chinese and American Engineers.
†T. D.—Taku Datum.



the date of Summer Solstice, the water in the Settling Basin just reached the limit of the area flooded in the spring, and the diversion was continued.

On July 8, another unfortunate incident occurred. The farmers in the Yung Ting Ho Delta, alleging that the regulating works at Chu Chia Tien had raised the water level of the Delta so as their land might be flooded, proceeded to the regulating works in a crowd of several hundred and opened the regulator gates by force. It should be remarked here that the flooding of the lower part of the Delta is the normal consequence of a strong freshet in the Yung Ting Ho and is in no way connected with the regulating works at Chu Chia Tien. The Provincial Government of Hopei was appealed to by the Hai Ho Improvement Commission to have this outrage stopped. A party of military police was despatched to the regulating works and the situation was got under control on July 12. Meanwhile the muddy waters of the Yung Ting Ho ran unchecked into the Hai Ho, and the river lost on an average about three feet in depth. From then on the regulating works were operated without further interference.

At first, the Executive Committee resolved to fix the limiting silt percentage of the combined flow of the Yung Ting Ho and the Pei Yun Ho for diversion into the Settling Basin at one per cent by volume, or 1.7 per cent by weight. On August 8, the Executive Committee for the betterment of the navigability of the Hai Ho resolved to reduce the limiting silt percentage to 0.8 per cent by weight. On September 25, the flow of the Yung Ting Ho subsided, having a discharge of about 20 cubic meters per second and a silt percentage of about 0.7 per cent by weight, and the diversion was therefore discontinued. The total inflow into the Settling Basin is about 860,000,000 cubic meters, and the total amount of silt deposited in the Settling Basin is about 18,500,000 cubic meters.

From the experience of this year's operation of the Hai Ho Palliative Scheme, the following two deductions are made:

(1) About two hundred years ago, an area approximating 600 square kilometers, known as the Yung Ting Ho Delta, was enclosed by dykes to serve as a basin for "spreading the flood and settling the silt." In time of freshet, the Yung Ting Ho would overflow this Delta into which its silt load would be discharged and its evil tendency to deteriorate the Hai Ho was thus mitigated. This Delta has recently outlived its usefulness. Its upper part has silted from six to eight meters above its original ground surface, and its lower part has been restricted to an ordinary flow channel by numerous cross dykes built by the farmers to save their land for the raising of crops, although it is prohibited to build any dykes within the Delta. According to measurements made this year, the silt percentage of the Yung Ting Ho at Chu Chia Tien reached 12 per cent by weight (June 23), and the silt percentage of the combined flow of the Yung Ting Ho and the Pei Yun Ho reached 10 per cent by weight (June 23). These data clearly verify the foregoing statement that the Yung Ting Ho Delta has ceased to be a detention basin. Should the Hai Ho Palliative Scheme not exist, *i.e.*, should the Hai Ho have to carry the waters of the Yung Ting Ho to the sea under the prevailing conditions, the Hai Ho and its Bar channel would become the prolongation of the Yung Ting Ho and the bed of the Hai Ho would have to rise considerably so as to adapt itself to a new slope with the Bar as its terminus. In that case, Tientsin would cease to exist as a port.

(2) The improvement of the navigability of the Hai Ho depends at present principally upon the proper operation of the Hai Ho Palliative Scheme. Before the summer of 1932, the Hai Ho could accommodate only steamers of eight feet draft. After the freshet of the Yung Ting Ho was diverted into the Settling Basin in the summer of 1932, and again in the spring of 1933, the permissible draft in the Hai Ho increased to 15 feet. In June and July of this year, because of the extraordinary circumstances described in the preceding paragraphs, the Hai Ho Palliative Scheme could not be operated satisfactorily, and consequently the Hai Ho was re-silted. However, since the Hai Ho Palliative Scheme was put under effective control once more, the Hai Ho has been gradually improved, and sea-going steamers drawing 13 feet can safely come up to Tientsin at this time.

In order to rectify its erroneous arrangements with the farmers and to make the Hai Ho Palliative Scheme fully operative, the Hai Ho Improvement Commission decided to carry out the following project for the completion of the Scheme, viz.:

(*a*) To extend the Settling Basin with the Hsin Kai Ho—Ching Chung Ho for its southern limit by demolishing the existing South Dyke and building a new earth dyke farther north, named the Partition Dyke, which divides the whole area into two sections.

(*b*) The northern section approximating 80,000 mou, named the Tien Pei Basin,—which is to be purchased, or failing the possibility of purchase, to be rented for a period of fifteen years—is to serve both as a Basin to contain the spring freshets as well as an emergency Basin to take the silt-laden waters of the Yung Ting Ho at any time it is considered advisable to divert them before the date of the Summer Solstice. The southern section, named the Ta Ho Tien Basin, is to serve as a Basin to contain the summer freshets from the date of the Summer Solstice to the end of the freshet season. Two inlets are to be built at the eastern end of the New Leading Channel just beyond the Peiping-Liaoning Railway for regulating the flow into each of the respective Basins.

(*c*) The clear water in the Tien Pei Basin is to be drained through the existing Outlet Sluice near Lu Hsin Ho, the existing Outlet Channel, the Ching Chung Ho, and thence into the sea.

(*d*) An Outlet Sluice is to be built near the southwestern corner of the Ta Ho Tien Basin on the north dyke of the Hsin Kai Ho, and a Weir is to be built across the Hsin Kai Ho adjacent to the Sluice, thus leading a part of the clear water from the Basin to flow back into the Hai Ho. A Navigation Lock is to be built beside the Weir to facilitate the passing of native craft.

(*e*) Another Outlet Sluice to be built at the south-eastern corner of the Ta Ho Tien Basin so as to drain a part of the clear water in the Basin also into the Ching Chung Ho and thence into the sea, thereby to empty the Basin promptly for the reception of further supply of muddy water.

(*f*) To strengthen the north dyke of the Hsin Kai Ho is to be utilized as the South Dyke for the Ta Ho Tien Basin. A North Dyke for the Tien Pei Basin is to be built near the border of Tien Tsin Hsien and Wu Ching Hsien. The villagers in the Ta Ho Tien Basin are to be protected with surrounding dykes.

The accompanying sketch map shows the modified location of the Settling Basin as well as the location of the various proposed works necessary for the realization of the final project, which, when completed, will enable the Hai Ho Palliative Scheme to cope with any future freshet which may occur in the Yung Ting Ho in the next fifteen to twenty years.

Whampoa as Deep Sea Port

The Kwangtung River Conservancy Board, after an extensive survey during the last two years, has completed a set of plans for the development of the projected ocean port for Canton city at Whampoa.

The detailed plans, for which Messrs. Wong Him-yik and Li Man-pong, engineers of the Board, are mainly responsible, provide for the gradual development of the port over a period of twenty years. The plans are being submitted to the Municipal Government, the Reconstruction Bureau and other government organs for examination.

The first stage of the plan will be for the construction of a harbor and the building of godowns. An area of about 11,145 mow has been earmarked for this part of the work and steps will immediately be taken if the present plans are adopted, for the acquirement of this area.

Available up to 5,000-ton Ships

The present depth of the harbor at Whampoa will enable a ship under 5,000 tons to enter it with ease, so that the port can be made use of as soon as harbor and godown facilities are available. The development of the port will then gradually be taken care of until it is provided with accommodation for ocean ships in accordance with plans laid down by the late Dr. Sun Yat-sen, who had chosen Whampoa as the site for China's port in the South.

The present scheme also includes the laying out of a well planned city, both commercial and industrial, in Whampoa which will be placed under the direct control of the Kwangtung Provincial Government. Different sections will be created for commercial, industrial, and residential purposes in this new city which is to be linked up with Canton by railway.

In allowing 20 years for the full realization of the scheme, the planning committee hopes that difficulties connected with finance and other matters will be reduced.

The Collieries and Subsidiary Industries of the Malayan Collieries Limited, at Batu Arang, Selangor, F.M.S.*

THE entire property covers an area of 9,000 acres of which nearly 2,000 acres are occupied by plant and surface workings and garden plots of the labor force. In normal times a labor force of about 3,000 is employed, while the total resident population ranges between 4,000 and 5,000 souls.

The coal extends throughout the property and occurs in two seams each varying in thickness from 20 feet to 40 feet.

The deposit which is of Tertiary age is classed as a high grade lignite or sub-bituminous coal and the properties are indicated by the following proximate analysis of coal as delivered to consumers :—

Moisture	21	per cent
Ash	9	,,
Volatile Matter	35	,,
Fixed carbon	35	,,
Calorific value		
"as received"	9,000	B.Th.U. per lb.
"dry coal"	10,000	,, ,,
"dry ash free"	13,000	,, ,,

The coal output from all sources is sampled at regular intervals and analyses and determination of calorific value are carried out as part of the routine work of the Service Department in charge of a Combustion Engineer at Head Office.

The coal is usually worked by means of two deep mines entered by inclines, and four Opencast mines, and the possible monthly output is in the region of 100,000 tons, but owing to the restricted output as the result of present trade depression only one deep mine and one opencast are being worked regularly. Other workings, however, are ready for immediate use and can be brought into commission to meet any increased demand.

The Company have provided and operate a system of standard (meter) gauge railway, having a total length of about 12 miles which runs throughout the Colliery area, and is the means of conveying the coal from the various workings to the main line, after passing over the F.M.S. Railways weighbridge immediately before despatch.

Power Plant

The operations are now electrified throughout, electrical power for all purposes being generated in a central station and transmitted to the various consuming points, partly by overhead and partly by underground cables.

In all there are about 100 motors connected up, the aggregate h.p. being approximately 4,000.

The power house contains the following plant :—

2 Metropolitan-Vickers Steam Turbo Alternators each 2,000 kw., 3,000-volts, 3-phase, 50 cycles.

The machines are entirely self contained. The turbine which is superposed on the condenser, runs at 5,000 r.p.m. and drives the alternator, exciter, circulating and condensate pumps at 1,000 r.p.m. through five to one single reduction helical gears.

1 Belliss and Morcom-B.T.H. reciprocating Set, 400 kw., 3,300-volts, 3-phase, 50-cycles, 375 r.p.m.

To serve the D.-C. demand there is :—

1 English electric reversible motor generator, synchronous speed 1,000 r.p.m. 3,300-volts, 3-phase, 50-cycles, on the A.C. side and 500-volts on the D.-C. side.

Augmented with :—

3 Browett Lindley reciprocating sets each 300 kw., 500-volts D.-C., 360 r.p.m.

All the reciprocating sets are non-condensing, this being due to the shortage of circulating water until the recent tapping of a source which ensures an ample supply of water for condensing purposes.

Main Control and Distribution Boards.—The A.C. gear by Reyrolle & Co., Hebburn-on-Tyne, fitted with modern protective devices, is installed on a raised gallery in the power house and comprises :—

9—Iron clad, compound filled oil circuit breakers each with rupturing capacity of 75,000 kva.

3 Neutral earthing switches, oil immersed type direct operated and suitable for 120 amps., 2,200-volts, single phase.

3 Exciter cubicles and voltage regulators, complete with relays and meters.

1 Synchronizing panel complete with illuminated dial volt meters and frequency indicator.

The main switch-board for the D.-C. side is situated at the floor level and comprises the following :—

4 Incoming panels fitted with single pole maximum, reverse current circuit breakers connected to 500-volts main busbars.

9 Outgoing panels fitted with double pole quick make and break knife switches and fuses each capable of carrying 300 amps.

There are also two switch cubicles on floor level which interconnect the A.C. and D.-C. sides of the plant through the motor generator.

Spray Cooling Equipment.—This includes a concrete pond 150 feet by 120 feet by four feet deep with an approximate capacity of 450,000 gallons. The pond is connected with the power house by a system of pipes and a concrete culvert. The banks of sprays are by Messrs. Bullocks & Co., London, and at the present time they handle about 3,500 gallons of water per minute although they are designed to deal with eventual extension three times this quantity.

The cooling effect of the sprays is approximately 10°F although with the present low load the temperature difference between the inlet and outlet water is only about 4°F. and the daily make up is at present less than one half of one per cent of the water in circulation. The pond and spray banks are divided into two sections and so arranged that either or both sections can be used at a time. This arrangement was found necessary in order to combat the algal growth that takes place on the walls and pillars of the pond and which, prior to the sectionalizing of the pond, necessitated shutting down the plant periodically in order to clean out the growth and prevent inadvertant shutting down as the result of fouling of the circulating water screens. Before sectionalization was resorted to a wide range of chemical treatments was tried but none was found to be successful.

Boiler House.—The existing installation in the boiler house comprises :—

3 Babcock & Wilcox W.I.F. type, double drum tube boilers equipped with mechanical chain grate stokers and integral superheaters, each unit having an evaporative capacity of 9,000 lbs. of water per hour.

2 Babcock & Wilcox W.I.F. type, single water tube boilers equipped with mechanical chain grate stokers and integral superheaters, each unit having an evaporative capacity of 7,000 lbs. of water per hour.

Working pressure of all boilers—160 lb. per sq. in. gauge.

Normal final steam temperature 550°F.

It is proposed later to replace the existing boilers by larger units under a working pressure of 250 lbs. per square inch, and a final steam temperature of 700°F, for which conditions the new steam turbine plant has been designed.

The chain grate stokers are driven by a Luth & Rosen combined electric motor and reduction gear with a reduction of approximately 25 to 1.

The boiler feed water pumps comprise :—

2 Centrifugal feed pumps direct coupled with electric motors and capable of delivering 133 g.p.m. against a head of 395 feet at 1,500 r.p.m.

with

2 Inter-coupled duplex standby steam pumps capable of maintaining the water supply in the event of electrical failure.

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The feed water is supplied by pump or by gravity, from the low level service reservoir into a common distributing tank near the boiler house and from which it can be drawn direct by the feed pumps or it can be passed to the hotwell as make up to the turbine condensate.

Coal Production

In normal times coal is produced from two deep mines and four opencast mines. The former are equipped to produce the normal demand of the Colliery, the opencasts being regarded more as an insurance and safeguard against any involuntary stoppage of production.

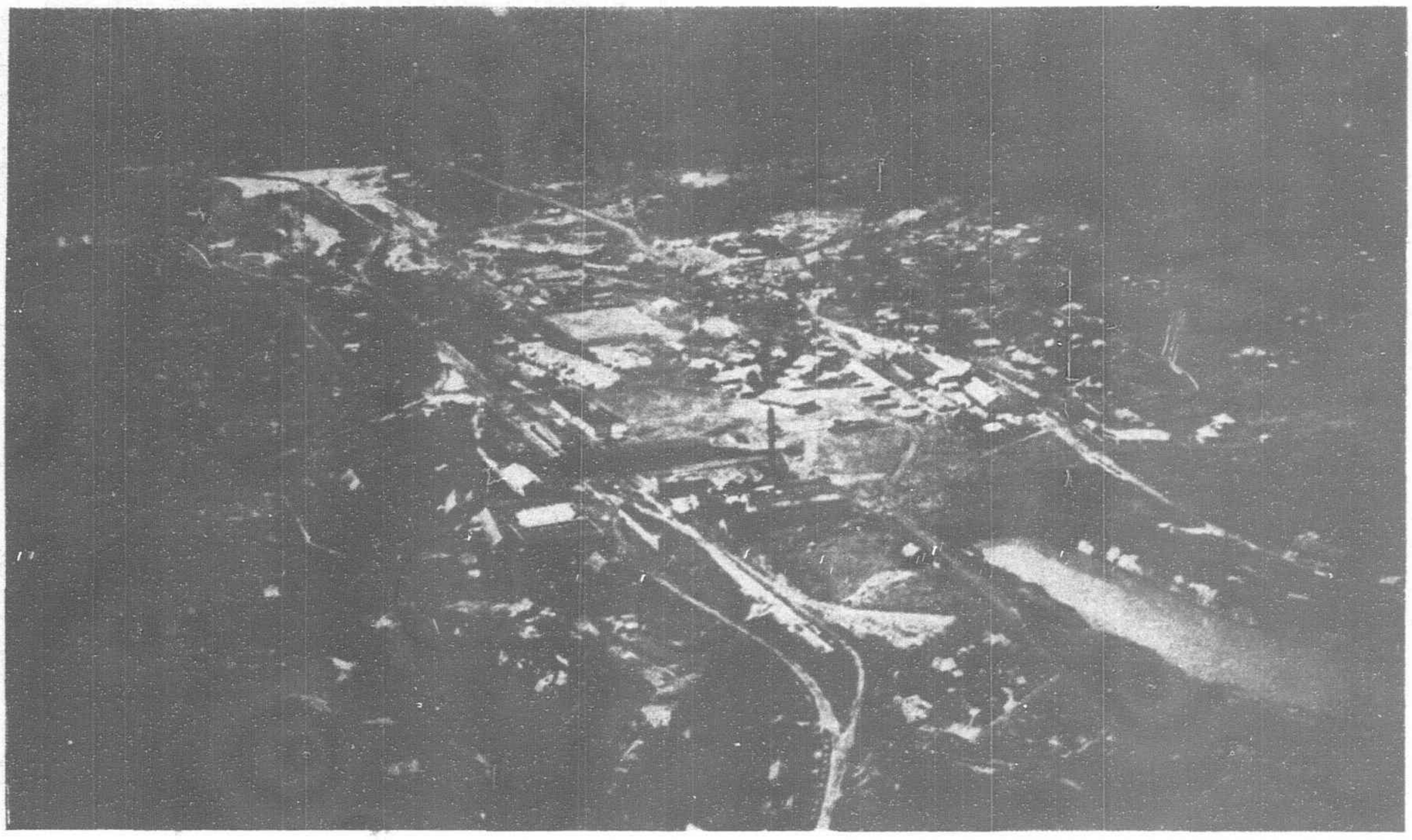


Fig. 1.—An Aerial View of the Property from 800 feet facing south with the Power Station in center foreground and Settling Pool for Hydraulic Stowage of Water pumped from underground

North Mine

This mine is at present closed down ; the plant has been withdrawn and the workings have been allowed to flood. It can, however, be put into commission when required either by re-opening the main incline or by entering the lower workings from one of the opencasts in the same seam. The following brief description of the mine as it operated may be included as a matter of interest.

The main incline of the mine is approximately one mile long, while the greatest vertical depth is about 800 feet. The total length of open roads and ways is four miles. The thickness of the seam is up to 40 feet and the normal output of the mine 25,000 tons per month.

Pumping.—Water from all sources was handled by five electrically driven four stage centrifugal pumps, each directly connected with a 130 h.p. motor, and having a capacity of 500 gallons per minute against a head of 500 feet.

Ventilation was effected by a 94 inch double Inlet Reversible Type Sirrocco Fan, driven by a 225 h.p. electric motor and exhausting approximately 150,000 cubic feet per minute at a water gauge of $2\frac{1}{4}$ inches.

This fan is still in position and will resume operation as before when the mine is re-opened.

Stowage.—Hydraulic sand stowage was carried out by gravity from surface bunkers in the manner described later.

Haulage.—The haulage up the main incline to the pit top is of the double drum type driven by a 75 h.p. steam engine for a rope speed of 7 m.p.h. Equipment is on hand for the conversion of this haulage to electric drive. Auxiliary haulage underground was performed by 1-50 h.p. and 2-10 h.p. double drum haulages and 2-6 ton electric storage battery locomotives.

East Mine

The mine goes to a vertical depth of 520 feet below the ground level and the total length of underground roads and ways under maintenance is about 12 miles. The length of the main dip roadway is 2,750 feet and the average gradient is about 1 in 4.5. The thickness of the seam averages about 24 feet and the rated output is 25,000 tons per month per shift.

Apart from secondary stowage places and a little development work the coal winning is concentrated in two districts each containing a panel of coal measuring about 1,300 feet long by 200 feet wide by 24 feet thick from which the coal is extracted on the longwall principle. The length of the longwall face is the width of the coal panel and the longwalls are worked in pairs one of which is termed the advance longwall. When one of the pair is being worked the other is being stowed and so the working takes place alternately on the two faces. In the event of an emergency of any kind occurring in one district, coal winning can proceed in the other or under normal circumstances both can be worked at the same time should demand be sufficiently large.

At the present time coal extraction has just been completed to the boundary in the first lift of No. 1 district and extraction in the second lift has just commenced.

Ventilation.—This is effected by means of a 56 inch dia : Sirrocco Fan driven by a 150 h.p. electric motor. The duty of the fan is 100,000 cubic feet of air per minute at a water gauge of $1\frac{3}{4}$ inch.

The mine is divided into districts and each district comprises

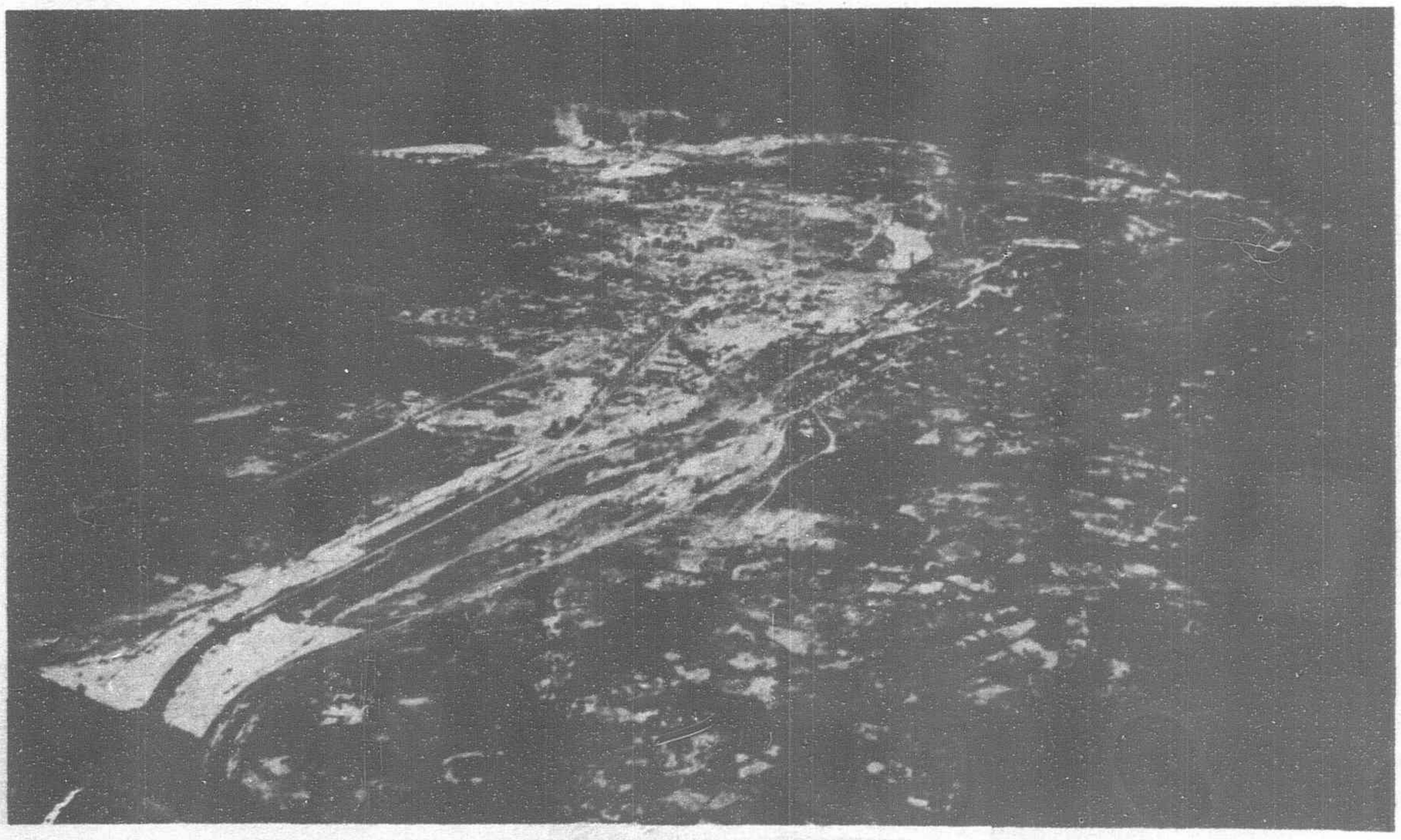


Fig. 2.—Facing north-west with Squatters' Dwellings in the foreground. Altitude 1,000 feet

one section of the ventilation system ; it can be controlled independently of the others and in the event of an emergency, any one district can be isolated without affecting the others.

Pumping.—To deal with ordinary mine water and water from sand stowage, two of the Colliery standard electrically driven centrifugal pumps are installed and work in conjunction with two eight inch 150 h.p. gravel pumps which handle slimes and secondary stowage material in two stages at lower levels. Each standard pump has a capacity of 500 gallons per minute against a head of 500 feet, all exposed parts being, as far as possible, proof against the acid content of the water.

Ordinary mine water and effluent from stowage barricades gravitate by way of bricked flumes to a large brick lined sump at the lowest level of the mine. From this sump the slimes are lifted by the first gravel pump to a settling sump situated at four levels higher up, the vertical lift being about 80 feet.

At the bottom of this sump on the dip side, are fitted spigots from which the settled slimes are tapped off and lead through launders and pipes to specially arranged workings where the slimes are used as secondary stowage in a manner similar to that adopted for primary stowage. The second eight inch gravel pump lifts the remainder of the slimes to another settling sump four levels higher up and the same tapping off and secondary stowage is carried out in a manner similar to that effected in the lower district. The comparatively clear water from which most of the slimes have settled out is then lifted to the surface by the standard pumps, one of which is ample to meet requirements and the other serves as a standby. To one of these pumps has recently been fitted a Michell thrust which it is hoped will lengthen the life of the pump considerably.

Screening.—The screening plant is of modern design and construction, and embodies rotary wagon tipplers, jigging screens of the ring plate type, and belt conveyors. The screened coal passes over the screens, down adjustable chutes and is loaded direct into the railway wagons where an inspector examines the coal and removes any foreign matter that has escaped previous inspection. The small coal goes through the screens and is collected by a belt conveyor which delivers it into the railway wagons on another line. Mine timber is elevated to pit top level by a reversible creeper, the empty timber wagons being returned to the timber yard by the reversal of the creeper chain.

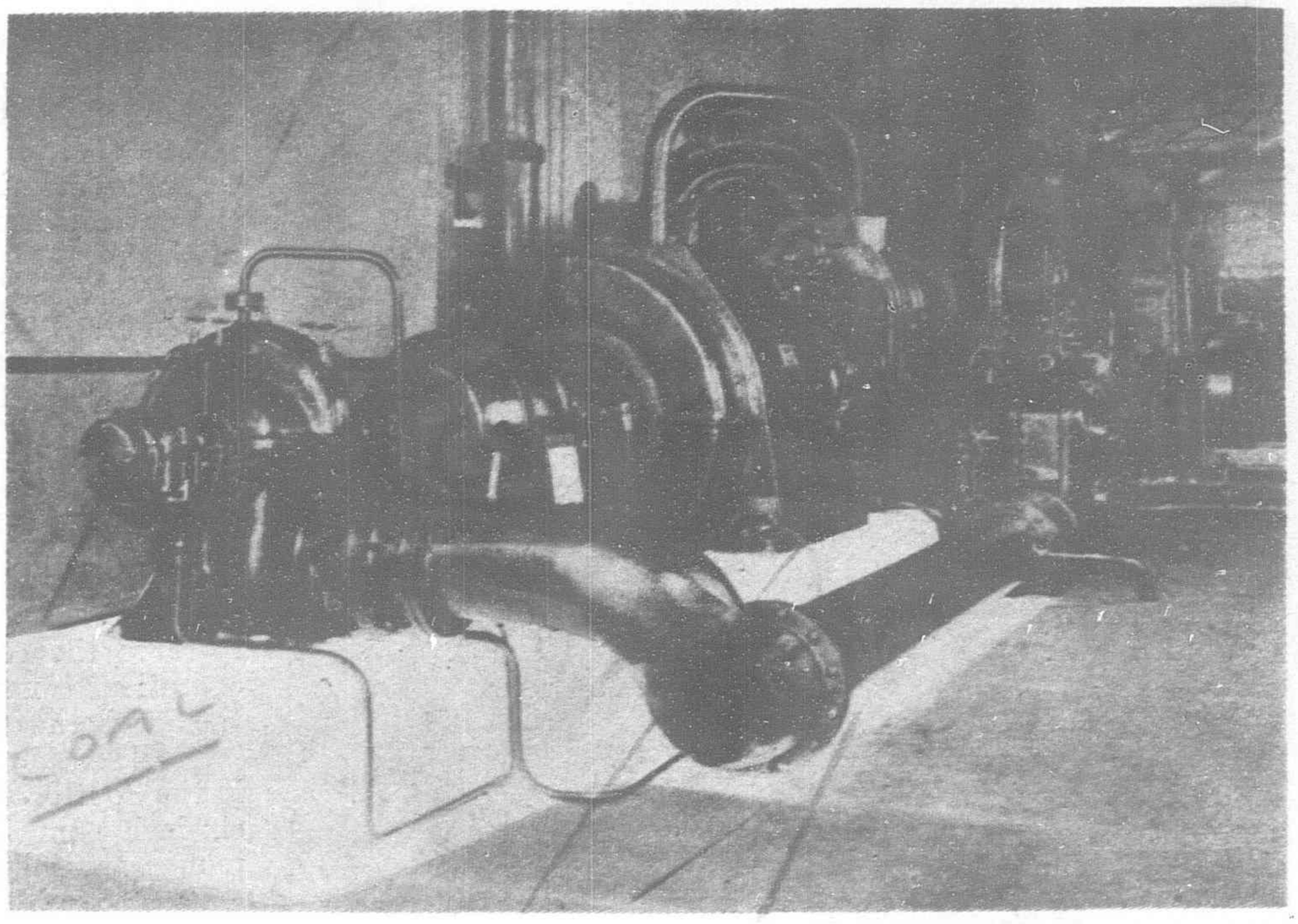


Fig. 3.—Part of the Power House with one of the Metropolitan-Vickers 2,000 k.w. Self-Contained Turbo-Alternators in the foreground

Haulage.—The main haulage is of the endless type and extends from the bottom of the main incline to the pit top. It is driven by a 75 h.p. electric motor and is fed by several auxiliary haulages which work in the various levels or roads which lead to the coal panels at present being worked.

Opencast Nos. 3 and 4

Owing to a fault rendering difficult the working of a part of the East Mine seam through the main East Mine entry, the faulted coal is being developed from the surface by means of two pairs of headings the inner one of each pair being 300 feet apart. This forms a long wall of that length which is laid out to produce 250 tons of coal daily by machine methods.

As in all instances of underground production at Batu Arang, this will entail the replacement of 250 tons of coal by approximately 250 yards of stowage material and at O.C. 4 a sand bunker has been constructed which will serve the requirements of the longwall in that district.

At O.C. 3 which is really a continuation of this opencast, the stowage material in the form of overburden is sluiced from above coal which is later to be won by opencast methods, and flushed directly underground, the solid material being retained within the area evacuated of coal during the previous day or so, by hessian lined barricades running parallel with the coal face, the effluent passing through settling areas at intervals along its one mile travel to the main East Mine Pumps.

In order to augment the overburden and to render it more suitable for stowage, a sand bunker is at present being constructed in the sluicing area and sand will be supplied to the bunker by means of a branch railway line, for mixing with the sluiced material as and when required. The haulage in connection with these two opencasts is done by three electrically operated double drum machines, two of 25 h.p. and one of 10 h.p. and one similarly operated endless haulage of 35 h.p.

These workings are not in operation at present but are so conditioned that they can be put into commission at a moment's notice.

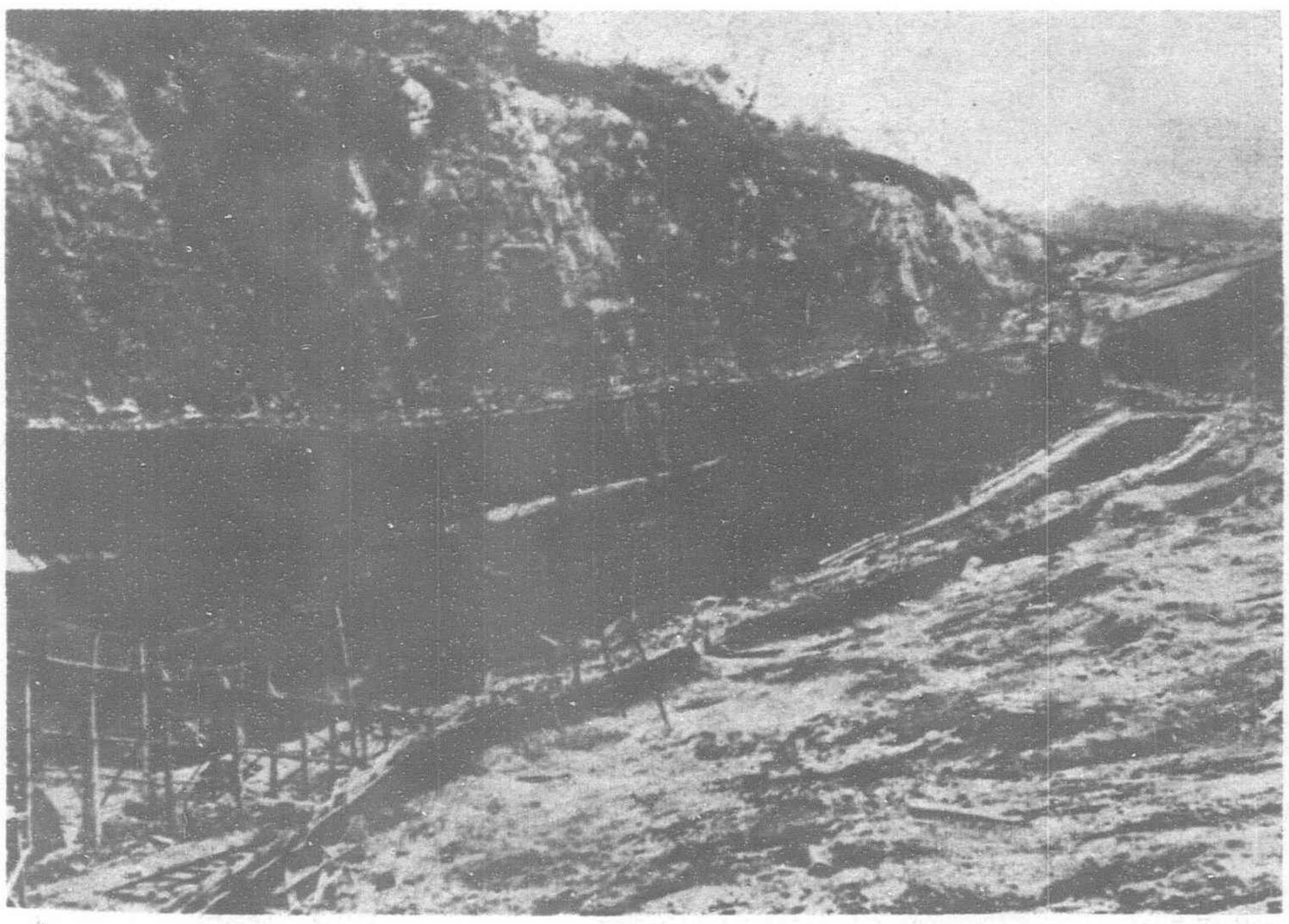


Fig. 4.—Opencast No. 7. Note Lines of Fire Clay running through the Coal Seam. Top right shows where the Seam Outcrops and is being opened up for Bord-Face Working. At lower left the Seam is at the stage where Opencast Working is no longer practicable

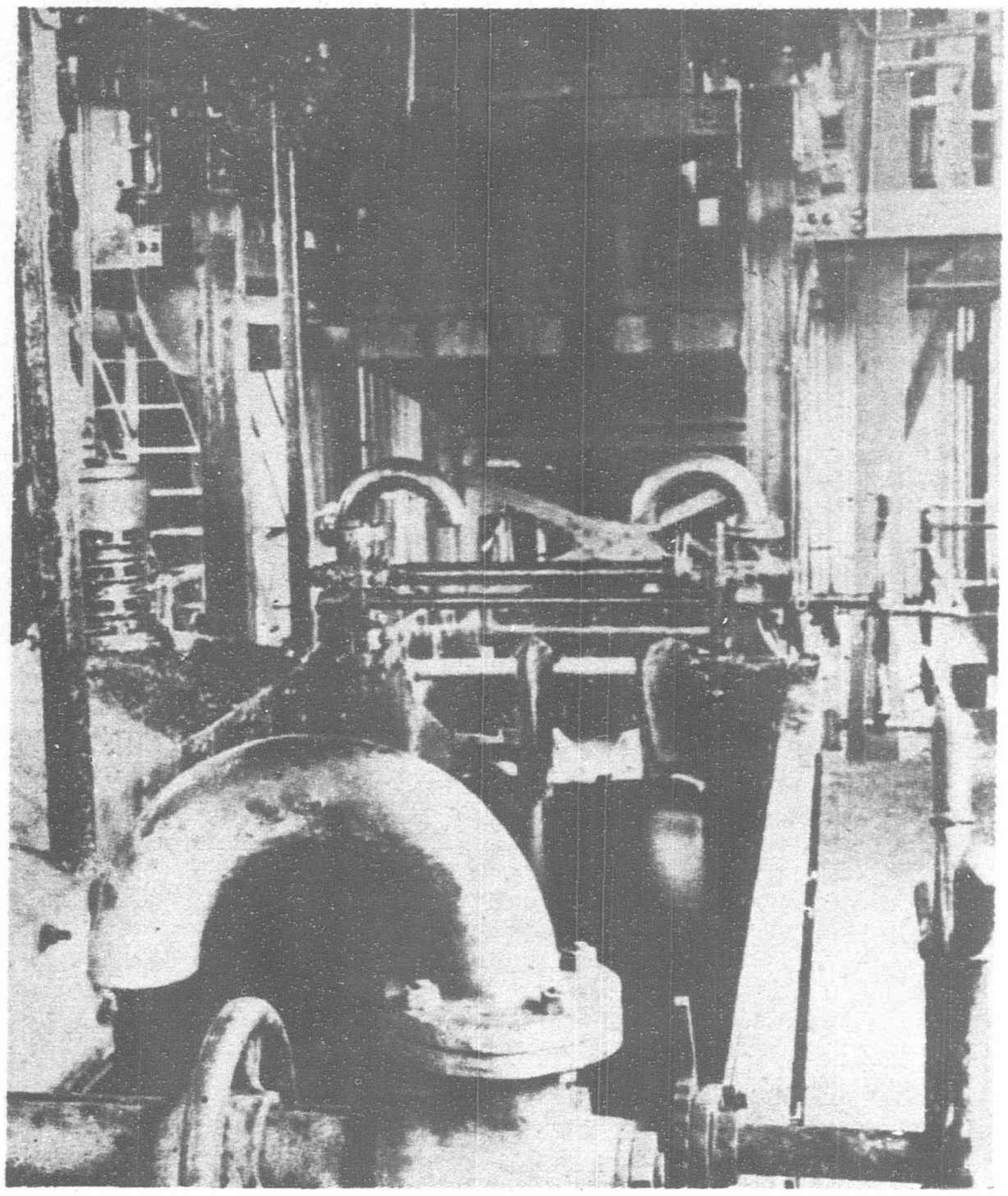


Fig. 5.—View of the Coal Washery from the Feeding End with the Washing Box in the foreground

Opencast No. 7

The development work in the form of shale stripping to uncover the coal was done by an electric shovel in conjunction with an electrically operated endless haulage. The shovel has a bucket capacity of $1\frac{1}{4}$ cubic yards, a maximum digging radius of 26 feet and the total horse-power of the motors is 95. The endless haulage serving the 3,000 feet of track was driven by a 35 h.p. electric motor.

The skips used were side tipping both ways and have a capacity of $1\frac{1}{3}$ cubic yards. The length of the cut varied from 1,000 feet in the earlier stages of development to 2,500 feet as the work proceeded towards completion. The capacity of the shovel is approximately 30 cubic yards per hour of shale shattered by explosives in advance. The explosives used then and now are of orthodox type but the adoption of liquid oxygen, carbon dioxide and other more modern types are under consideration, and a plant for their manufacture will probably be installed.

This opencast forms a good illustration of opencast mining operations and shows very clearly the inclination and thickness of the seam and the extent to which it can be worked by opencast methods. The limiting factor in this respect is, of course, the relation between the thickness of the coal and that of the shale and overburden above it and when the economical limit of extraction has been reached the opencast ceases to exist as such and a mine commences. Inclined roads are driven into the coal face and further extraction is on the underground principle.

The coal winning program now in operation is well advanced and in part of the Southern section it has been completed. The thickness of the coal seam is about 30 feet and the method of extraction is on the bench principle. Three benches were worked in the width of the face and the maximum height of each was about 12 feet and each was served by the haulage system. In order to ensure efficient working and to obtain the maximum percentage of lump coal each bench was worked on the bord face principle which ensured that the maximum amount of coal could be won with the minimum amount of handling. Further to reduce handling and to simplify winning, the coal was loosened by explosives in advance.

Development of the coal exposed in the Northern section proceeds and when extraction has been completed in the Southern section coal winning operations will be commenced and a similar system of extraction will be adopted, but for various reasons in this case, the coal will be worked from the point of shale contact towards the outcrop instead of the opposite way, which is the more usual method.

Haulage.—The main haulage, which is of the endless type, is driven by a 35 h.p. motor and conveys all coal, shale and spoil from the mine to the loading or dumping point. The main incline has an average slope of one in four and is about 600 feet in length. At the bottom of the incline the haulage turns at almost right angles to serve the length of the Southern section of the Opencast at present being worked. A 20 h.p. auxiliary endless haulage is situated near the foot of the main incline and serves the shale and coal operations that are being carried out at the block at the extreme end of the Southern section. Haulage track is being laid to serve the coal area in the Northern development, and when operations commence the main haulage will be disconnected from the Southern section and coupled up to the North end.

All seepage and catchment water is drained to a sump situated in the South corner of the Southern section where it is lifted by two six inch pumps through a 10 inch main to a surface drain. The pumps are Allen Conqueror type and each has a capacity of 700 gallons per min : against a head of 150 feet and is driven by a 52 h.p. motor.

Sand Pit

This opencast provides a considerable quantity of the sand required for hydraulic stowage and the bulk of the sand is won in the course of coal stripping. At the present time a $\frac{3}{4}$ cubic yard Ruston Shovel is operating in the sand pit which is situated to the East of the Northern section of the mine, in conjunction with a 20 h.p. haulage. The sand is conveyed to the loading gantry where it is tipped into the Company's wagons and transported by locomotive to the sand bunkers. A new sand winning area is being opened up beyond the Northern Coal section and this will be served by a 35 h.p. endless haulage circuit and will be worked by means of a $1\frac{1}{4}$ cu. yd. Bucyrus electric shovel.

Opencast No. 8

At the present time this opencast is not being worked, but is being used as a wet storage for surplus smalls. Owing chiefly to the effect of tin restriction the demand for small coal has decreased considerably and smalls are now produced in excess of requirements. The coal does not deteriorate when stored under water and as conditions improve it will be picked up and sent to the washery and despatched. Until recently in this opencast, a half cubic yard single motor electric shovel operated on coal and another machine of similar capacity but with five motors worked overburden in the North end.

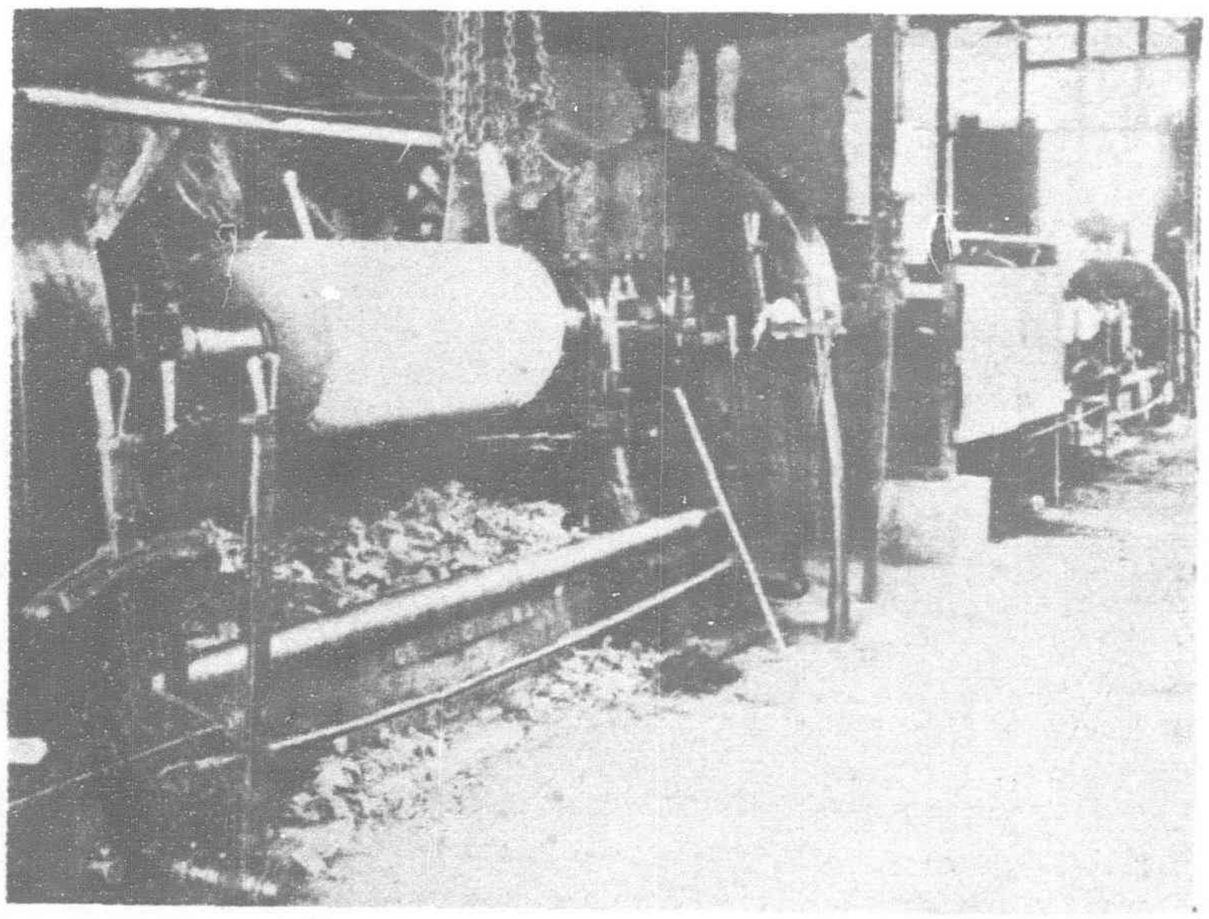


Fig. 6.—Two Veneering Lathes in the Plywood Works. Each has an output of almost 3,000 square feet of veneer per hour

It is proposed at a later date to resume stripping operations in this opencast and for this purpose it is intended to procure a $2\frac{1}{4}$ cubic yard shovel the design of which will be somewhat different from that of the other machines. The larger machine will convert its power on board from 3,300-volts A.C. to 240-volts D.C. to suit the five individual motors with which it will be fitted.

This method and the well known Ward Leonard system of control give much greater flexibility than is possible with a straight alternating current drive, and is much more economical in power consumption. The development program for this mine provides for a coal loading gantry and screens to span the new rail sidings, which will be operated in conjunction with the coal washery situated on the East of the opencast.

Almost all of the clay requirements of the brickworks are stripped from within the development area of this opencast, although at the present time owing to the restricted output of the brickworks very little clay is being won. The clay is loaded from a face 1,500 feet long, direct into railway wagons which are in turn locomotive hauled to the elevated track above the raw materials bays at the works. The great length of face systematically worked will ensure a preliminary mix of the raw clay and so aid in obtaining a raw product reasonably uniform in quality.

The main entrance railway siding past this opencast is to be deviated to provide better marshalling facilities and also to make available for recovery a large quantity of coal situated under the existing track. The new track has been laid and is now partly in use but it has not yet been connected into the F.M.S. Railways line at Batu Arang station. A new 60 tons weighbridge which is the property of the F.M.S. Railways has been installed, and this will operate in conjunction with the new sidings.

The foundations and building for the weighbridge were supplied by the Company.

Coal Washery

This plant has been in commercial operation for some little time with entirely satisfactory results. The coal treated is that which, as produced, contains a higher percentage of ash than is permitted in coal despatched for sale. The capacity of the washery is 40/50 tons of raw coal per hour, according to the percentage of shale contained therein.

The coal to be washed is conveyed from the various points of production to the washery in the Company's eight ton wagons. From the receiving bunker at the washery, the raw coal is elevated to a horizontal picking belt on which, in the course of travel, it is subjected to a preliminary picking by hand. From this belt the coal gravitates through a crusher into a hopper, and from this into a bucket elevator from the discharge end of which the coal is delivered into a stream of water and carried along to the washer box in which the actual washing is done.

This washer box takes the form of a " U " tube closed at one end and open at the other. On the closed side pulsations are delivered to the column by means of air pressure and the coal is carried on a screen plate on the other.

The pulsations delivered to the water cause an alternate uplifting and suction effect on the coal bed as the result of which the heavy foreign materials such as shale and clay, etc., sink to the bottom, from where they are continuously extracted by a screw conveyor for discharge, via a bucket elevator into shale wagons below.

The light clean coal is carried over by the water on to dewatering screens which, with their jigging motion, convey the dewatered washed coal forward for discharge over a chute into railway wagons below. The water used for washing is in constant circulation and a conical shape settling tank is incorporated to take the slurry and sludge out of the water and deliver it in a more or less clean condition back into the system. The make up water is provided chiefly by the clear water sprays which are used to brighten the coal at the commencement of the dewatering screens. The clean slurry is dewatered on a special set of jigging screens and can, if desired, be mixed with the washed coal or filled separately.

The whole operation is under laboratory control, samples of the raw coal, washed coal, slurry and dirt rejected being regularly collected and tested by the chemist in charge.

The coal testing laboratory is situated to the West of the Washery and contains modern electric equipment for making analyses of coal and the determination of its calorific value.

Hydraulic Stowage

To ensure maximum possible extraction with the minimum risk of spontaneous combustion in the workings, all coal won by underground methods is replaced by a suitable material hydraulically stowed.

Coal is won from the underground mines in eight feet lifts by what is known as the " Long Wall " method of extraction. The bottom eight feet of the seam is taken first to a pre-arranged boundary, always working to the rise, and as the face advances the void is filled with a mixture of sand and crushed shale or other suitable materials, hydraulically stowed through pipes from the surface.

When the prearranged boundary is reached, the sand stowage, which has replaced the bottom lift of coal is used as a floor from which the second lift of eight feet is worked, and so on, until the full thickness of the seams, which varies from 20 to 40 feet, is extracted.

It is the general practice in all cases other than the Longwall face worked through O.C.3, to convey the sand and crushed shale or other suitable material by rail to stowage bunkers on the surface, each with a capacity of from 500 to 1,000 cubic yards, and from which the sand is washed into a mixing chamber by hydraulic jets and from there through pipes to the various points to be stowed.

The pipes which are connected by flanges, and are either five inch or seven inch in diameter, convey the solids suspended in water to the areas behind the Long Wall from which coal has been removed during the previous day or so, and around which a prop and timber frame has been arranged to take a lining of jute hessian. The hessian is of a suitable texture to retain the solid material, more or less colloidal slime excepted, while the water is released to flow through a settling area to the main pumps which return it to the surface for further use.

The practice of hydraulic stowage, although expensive in application, not only ensures the extraction of the maximum possible percentage of the total coal in the seams, but also minimizes the incidence of spontaneous combustion in the workings by taking up the weight of the roof, which, in mines employing methods other than longwall and hydraulic (or solid) stowage would be carried by pillars of coal with resultant crush, and, in the case of Batu Arang coal, heating and eventual combustion.

Although at present, as a result of the contraction of sales by more than half, the Company is drawing the whole of the stowage material from stripping operations at Batu Arang, in the past, anything up to five trains per day, each of 22 by eight cubic yard wagons, have been drawn from the Company's sand pits at Pengkalen Kundang. These sand pits are equipped to produce up to 1,200 yards of material per day, which, after being passed over tables to extract the tin content, is loaded by gravity into railway wagons.

Rescue Station

The station is equipped with all the necessary apparatus for rescue work, including gas masks, oxygen equipment and general first aid requirements.

Owing to the concentration of underground operations in the one mine, most of the rescue apparatus has been taken to the office at the pit top where regular practice in its use is carried out under the supervision of qualified Europeans.

In connection with first aid work regular instruction is given to the miners by the Resident Medical Officer.

Workshops

These comprise, Fitting and Machine shops, Smith and Plate shops, Foundry, Woodworkers shop, Electricians shop and Locomotive shop.

The various departments contain suitable and sufficient quipment to meet all the maintenance requirements of the property. The Foundry has recently been extended and can produce all requirements of bronze and iron castings, the latter to a weight of 25 cwts.

The Locomotive rolling stock comprises :—

4-18 ton Hunslet, side tank locomotives 12 inch by 18 inch, four wheels coupled.

2-28 ton Manning Wardle side tank locomotives, six wheels coupled, 13 inch by 20 inch, superheated and fitted with lighting turbo generator.

1-28 ton Manning Wardle, side tank locomotive, six wheels coupled, 13 inches by 20 inches, without superheater and lighting unit.

Wagon rolling stock totals about 275, made up of Low and Highsides, Covered Wagons and Timber bogies.

Stores

The Colliery stores and spare parts are housed in three large brick buildings, while an area between is utilized as a stock yard for rails, pipes, arching steelwork, and other such material that can be exposed to the weather.

Water Supply

In laying out the new supply, the requirements were based upon 700,000 gallons per day, made up of 540,000 gallons for power and industrial purposes, and 160,000 gallons for domestic purposes, although the whole layout is sufficiently flexible to permit of a material increase if necessitated by future developments.

The catchment area is in the Rantau Panjang Forest Reserve and comprises, including the area of 25.5 acres inundated, some 456 acres. The impounding reservoir has a storage capacity of 85 million gallons, a length of about 3/4ths of a mile and a depth of 26 feet.

The reservoir is formed by the construction of a puddled clay core earth dam across a ravine 550 feet wide. The dam of this length is 29 feet high, 180 feet wide at the base tapering to 10 feet at the top, the slope of the sides being three to one. The earth materials used in construction were 4,000 cubic yards of clay for the core, 12,000 cubic yards of selected material for filling next to the core and 16,000 cubic yards of ordinary filling on the slopes.

Three four feet by four feet brick and concrete culverts, side by side, pass through the dam, being closed at the upstream end by three feet by four feet steel penstocks, operated in the usual manner from a bridge on the left bank, three feet above top water level.

The spillway, 730 feet long by 60 feet wide, has been cut from the hillside at the left end of the dam. The overflow depth is two feet three inch for a maximum flood of 107 cusecs which represents six inch of rainfall over the whole catchment in 12 hours. The first 330 feet of the spillway is level, the remaining 400 feet being divided into eight grades of one in 70, separated by drops of three feet over three concrete steps.

The pumping main 5,720 feet long, with "Victaulic" joints throughout. The first 820 feet, being of 12 inch steel tube with a floating arm outlet, passes through the concrete roof of the culvert to a single stage centrifugal pump, directly connected with a 52 h.p. motor, situated at such an elevation that it is supplied by gravity unless the water level in the reservoir falls below half depth. On the delivery side of the pump the pipe is reduced to eight inch, and continues at this size over the 4,900 feet to the Low Level Service Reservoir into which it discharges 850 gallons per minute, against a total head of 180 feet of which 79 feet is static. The usual dry well and vertical pump arrangement was dispensed with owing to the advisability of adopting one of the colliery standard horizontal pumps.

The Low Level Service Reservoir is an open, mass concrete, tank 120 feet in diameter by 12 feet deep, to hold 675,000 gallons of water at a depth of 10 feet. The tank is divided into two compartments, so that it may be used as a settling tank. With the main pump operating at its rated capacity, the tank can be filled in 13½ hours. Each compartment is provided with a 12 inch floating arm outlet, while the Western compartment is also provided with a four inch floating arm outlet from which the water gravitates to a single stage centrifugal pump directly connected with a 10 h.p. electric motor, situated at a distance of about 400 feet.

This pump delivers to the High Level Reservoir 120 gallons per minute through 1,300 feet of four inch main: two five feet diameter Jewell Filters being situated about half way. The total head against this pump, including the resistance of the filters, is 180 feet, of which 134 feet is static. The capacity of the pump is the same as that of the two filters, namely, 7,200 gallons per hour.

The High Level Service Reservoir is a covered mass concrete tank 40 feet in diameter by 10 feet deep, to hold 64,000 gallons of water at depth of eight feet. The elevation of this tank will make possible a gravity supply of filtered water to any point on the property, a break pressure valve at 100 feet below top water level being provided to reduce the stress upon the fittings below that level. The lower levels will eventually be served by a main from the Low Level Service Reservoir to the Power House, a separate battery of four six feet diameter pressure filters being provided for this purpose. The completion of this work will make possible a piped supply to all principal consuming points, and the installation of waterborne sewage.

Brickworks

Owing to the depressed state of the building trade, the demand for bricks during the last year was insufficient to absorb the production of the works, and with the accumulation of sufficient stocks to take care of the likely demand for at least twelve months, it was decided to cease production of standard engineering and building bricks, in pursuance of which policy the large continuous kiln was allowed to cool off. The downdraft kiln, however, remains in use in order to meet the demand for firebricks and any other specials of which sufficient stocks are not available.

The following describes briefly the normal operation of the works.

The raw materials comprising plastic clays, sandy loam and weathered shale used in the manufacture of "Malacol" products are delivered to the storage shed by rail from the clay pit and other workings. The shale, which is sometimes obtained from the central crushing plant where stowage material is the primary product, is further crushed by high speed rolls, otherwise it is obtained direct from the shale dump. The fine material is elevated to an overhead rotary screen and bunker and the oversize is returned to a seven feet diameter dry pan for further grinding. The clay and loam storage has a capacity of 500 cubic yards and is sufficient for four days requirements. The proportioning is effected by compartment tubs which, when filled, give the required quantity of each material. The full tubs gravitate past the loading bays to a large capacity two shaft horizontal mixer driven by a 50 h.p. motor, the empty tubs being conveyed by means of a 5 h.p. endless haulage, back to the head of the loading bays.

The proportioned material is delivered to the double shaft mixer at the rate of about 50 tubs per hour. The mixed material is then elevated by means of an 18 inch belt conveyor, 85 feet centers, to the top rolls of the brick machine.

In this machine, which is driven by a 150 h.p. motor, the material passes through three sets of closely set rolls and a double shaft mixer and finally through a pug mill and die from which it exudes at the rate of 26 feet per minute in the form of a slab 9¾ inch wide by 4¾ inch thick.

The slab is cut to lengths of about two feet 10 inches and moved on to the table where each is wirecut by one movement into 10 bricks. The wirecuts are placed on stillages which are conveyed by a lifting automatic truck to the drying floors where the bricks remain for about 48 hours before being put into the kiln.

The bricks for pressing are passed down an oil lubricated inclined table to the presses which have a combined capacity of 3,000 per hour, from where they are taken to the drying floors by lifting trucks.

The drying floors are heated by steam supplied from the main boiler house, and have an area of 20,000 sq. ft. and a capacity of about 50,000 bricks per day.

The dried bricks are lifted from the floors and set in a 14 chamber improved Hoffman Type Kiln, of which each chamber is 21 feet long, by 16 feet wide by nine feet high with a capacity of 20,000 bricks. Malayan coal is used for firing and is fed by gravity from the top of the kiln. The travel is between 30 and 35 chambers per month, and the rated capacity is 750,000 bricks monthly. In addition to ordinary common building bricks, either wirecut or pressed, this kiln is used for firing perforated and cavity bricks and hollow building blocks. The draft is created by a brick stack 50 feet high or by a 50 inch Sirrocco fan directly coupled to a 30 h.p. motor, and connected to the chimney. Designs have been completed for a second kiln of a similar type, but embodying a number of improvements, and of 22 chambers capacity.

For other goods, such as roofing tiles, glazed and sand faced bricks and glazed sanitary pipes, a down draft kiln is placed on the South West corner of the works. This kiln is 40 feet long by 16 feet wide by nine feet high and has a capacity of approximately 5,760 cubic feet. Firing is effected by Malayan coal fed to twelve fires, six on each side and draft is natural by multiple chimneys. When this particular type of kiln has proved satisfactory, and when trade

conditions improve, further units will be added as the capacity of the works is built up.

Tile Making Plant

The Tile-making plant is situated at the North West corner of works and is laid out so that it can be extended to obtain increased output and to include a pipe making department.

The present plant is of the nature of a pilot plant and only the minimum amount of machinery has been installed, although the possible output is of the order of 150,000 interlocking roofing tiles per month.

The raw materials which are similar to those used for brick-making are spread on a steam heated drying floor of 1,550 square feet area, where they are thoroughly dried prior to grinding.

The brickworks grinding plant is available for the tile plant and the ground materials are transported in skips which gravitate to a hopper into which the contents are tipped. This hopper forms the boot of a bucket belt-elevator which conveys the materials to an overhead four-compartment storage bunker. Before reaching the bunker the materials pass over a plate screen and then to any one of the compartments by means of a spiral conveyor. The trough of the conveyor is fitted with doors which can be opened in order to deliver the materials to the compartment desired, and each compartment will contain its particular class of ground material. The bunker compartment bottoms are roughly conical in shape, and are fitted with slide valves which are opened to admit the materials to batching tubs which receive the materials in the desired proportions.

The batching tubs convey the materials to the wet grinding pan into which they are placed after receiving a preliminary mix.

The pan, which is by Johnstone & Co., is nive feet diameter and is belt driven by a 24 h.p. motor. After being thoroughly ground and brought to the desired degree of plasticity by the addition of water, the material is extracted from the pan by means of shovel attachment and conveyed to the souring floor by flat topped trucks. After being allowed to sour for at least a week the clay is taken to a 45 h.p. pugmill where it is further rolled and mixed and from which it is exuded in the form of a column about nine inch by $5\frac{1}{2}$ inch. As it exudes it is wire cut into five slabs about 12 inch in length and one inch in thickness. From the cutting table the slabs are passed along table trays where they are oiled and prepared for feeding to the tile press.

Should it be found beneficial a further souring or tempering process will be included between the cutting table and the tile press.

The tile press, which is by John Whithead & Co., is belt driven by a 10 h.p. motor and has an output of 500 tiles per hour.

A feature of the press is the double pressure action effected by means of three cams one of which lifts the die between the two presses, the object of the double press being to allow air to escape before the final pressure is applied.

The lower die of the machine comprises a revolving drum fitted with five dies, and the drum revolves one-fifth of a revolution at each movement, coinciding with the upper die which moves only in the vertical direction. The oiled clay slabs are fed to the press by hand and are taken into position by the revolving drum. The pressed tile emerges at the other side of the press and is collected on a wooden pallet as it drops from the lower die.

Between the process of collecting the tile and feeding the slab, the lower die is cleaned and oiled. The tiles are then trimmed by hand and conveyed on barrows to the drying racks, positioned over the main steam heated floors, where they remain for about four days before being set in the kiln for firing. When the future of the tile is assured further mechanical equipment will be added and handling will be reduced to a minimum.

Ceramic Research

Adjacent to the Superintendent's office is a laboratory which contains the latest equipment for examining and testing raw materials and finished goods, and the Ceramic Chemist devotes his time to the improvement and development of the various products. For small commercial scale tests of various combinations of materials in goods of different kinds, a small kiln to the South of the laboratory building has been provided.

In connection with the laboratory work there is a small experimental pottery department which has archieved some quite interesting results.

Plywood Works

This factory has been in commission for about a year and half and as the result of the encouraging reception given to "Malaply" products the plant has been extended and the output increased by about 50 per cent.

All timber used is obtained from the vicinity of the factory, the output of which is about 20,000 square feet of plywood, or 60,000 square feet of veneer per day. This takes the form of rubber chests, pineapple cases, building panels for ceilings, walls and doors, etc., in which latter connection precautions are taken during manufacture to render the product impervious to the effect of moisture and the attack of insects.

The logs arrive from the forest by rail in lengths of about five feet and diameters of up to 40 inches, and are either discharged into the storage pond or taken to the steaming vats. From the vats they are conveyed by overhead runways to the lathes where they are peeled into veneers from one to two millimeters thick by 42 to 54 inches wide. The veneers then pass along a slat conveyor to the clipper where they are cut into lengths of about 44 inches, after which they are placed on drier cars and passed through the progressive drier. In this drier an air flow of some 40,000 cubic feet per minute is produced by a 48 inch centrifugal fan driven by a 45 h.p. motor, heating being effected by a bank of steam tubes. The moist air is exhausted by a second fan at the opposite end of the drier.

The dried veneers are taken to the glue spreading machines and then to the hydraulic press. Thirty sheets of plywood are pressed at a time, after which the plywood is returned to the drier for final drying.

Split or undersize veneers are put through a taping machine which joins them up and makes them equal in quality to an unbroken veneer.

From the drier the finished plywood is taken on trolley tracks and delivered to the edging machine or guillotine, where it is trimmed and cut to the required size, after which it passes to the sanding machines to receive the desired finish. The plywood is then ready for packing, or fitting to suit requirements.

The battens department takes its wood supply from cores from the peeling lathes or direct from the logs. The logs and cores are broken down in the Sawmill and passed in the form of planks to the edging machine which produces the batten stock, one inch by one inch by five feet. The stock then goes to the thicknessing machines where it is sized to $\frac{7}{8}$ inch square, after which it is loaded on to ball bearing trucks and passed through the drier. The thoroughly dried stock is then cut into battens as required and packed for despatch.

Sawmill

In addition to supplying planks and batten stock for the Plywood Department the Sawmill provides the general sawn timber requirements of the Colliery.

The mill, which is electrically operated, has a capacity of about 5,000 board feet per day and comprises the following machinery :—

1-54 inch Rack-feed Circular Saw Bench with 32 feet carriage for breaking down.
1-30 inch Vertical Frame Saw for planks, etc.
1-36 inch Saw Bench for edging and small dimensions.
1-14 inch Circular saw edging machine.
2—Thicknessing machines.
1—Four cutter planing machine.

With a view to extending its sawmill activities the Company has recently acquired a complete sawmill and logging plant capable of turning out 50,000 board feet per day. The site has been prepared and details of the mill layout are being considered, and negotiations are proceeding with Government in connection with forest areas for logging.

Wood Distillation Works

This plant is situated due North of the Plywood Works and due East of the Sawmill site and it is designed to operate in conjunction with these works.

The plant has had a satisfactory trial run and operations are suspended pending complete examination of the various products.

The capacity of the plant is 30 tons of air dried timber per day and the timber used for distillation is obtained from waste from

the Plywood Factory, Sawmill and Workshops. The plant under normal conditions will operate continuously and the main products will be charcoal, grey acetate of lime, wood alcohol and wood preservative.

The wood after sufficient seasoning in the yard sheds is filled into special cars dimensioned six feet by 10 feet by four feet six inch, four of which are run into each retort. The retorts are then closed and subjected to heat. The tar and liquor separated out in the retort condensers are led to the settling vats which are of sufficient capacity to hold three days supply. From the crude pyroligneous acid vat, the liquor is led to the acid stills and the condensate therefrom to the clear acid storage tank. The clear acid is then neutralized with lime and the neutral liquor is pumped to the neutral liquor vat, from which the liquor is led to the Lime Lee stills. The condensate from the Lime Lee still condensers is led to the crude alcohol storage tank and from there to the rectifying still and thence to the refined alcohol storage tank. The residue in the Lime Lee stills is led to the seeding pans from which, when most of the water has been evaporated, the acetate of lime is filled out on to the drying floor.

The residue of the acid stills is led to the tar storage tanks and thence to the tar still, the vapors from which are led to the acid condensers.

All stills, condensers, storage and settling vats are arranged at suitable levels whereby gravitational flow is made use of to the maximum extent possible. One of the retorts is so connected that it can be isolated for the purpose of carrying out experiments on distillation of coal, rubber and other products.

After distillation of the wood has proceeded for about 36 hours the charcoal is removed by mechanical haulage, water quenched, and run into the coolers where it remains for about 24 hours. The charcoal is then taken to the store where it is graded and made ready for sale.

The stills are heated by means of steam coils and the acetate drying floors by the gases from the retorts and from the steam boiler. All gases are led through flues to a common self-supporting steel chimney six feet diameter and 100 feet high which is capable of producing draft for any normal extension to the plant.

A laboratory is incorporated in the Superintendent's office where samples of the various products are exaimed by the Chemist.

Cement Manufacture

Very complete investigations have been carried out on the materials available for the manufacture of cement, and it is hoped that it is only a matter of time before the Company will feel justified in adding this to its activities.

Agriculture

The Company, being anxious to utilize the agricultural possibilities of at least part of its leases, has been experimenting with different products, an area of 17 acres being utilized for this purpose. Results to date have not been sufficiently conclusive to justify any definite recommendation.

Administration

The main office building houses the Mines Superintendent and officials of the various departments, with the exception of the Under Managers who have their own offices at the North and East Mines, and the Opencast Superintendent, who has a more centrally situated office. The Brickworks Superintendent and Chemist are housed at the Brickworks, as is also the Plywood Superintendent at the Plywood Works.

Telephone System

There is a telephone system with just under 50 connections which link up every important point on the property, both on the surface and underground. The Colliery office is connected with the Head Office in Kuala Lumpur by a private line.

Hospital

There is a Hospital and a dispensary in charge of a resident Medical Officer where all persons employed on the property receive treatment free of charge, although it can be said that the property is remarkably healthy and free from disease.

Building

The European members of the staff are accommodated in bungalows on the slopes of the hill facing East and overlooking the main operations.

The labor force is housed in buildings of various types and it is hoped to complete the conversion from temporary and semi-permanent buildings at an early date. A recent addition in this connection are the Tamil lines at the East side of Opencast No. 8. They are constructed of brick on concrete foundations and have a Salonit roof. A jack roof, and perforated ventilation bricks provide for the necessary ventilation. There are 20 houses in each of the two rows and each house has its own kitchen, placed at a suitable distance in front. The total number of occupants is 140.

Between the two lines are the bathrooms and lavatories suitably arranged to accommodate all users. A trough flushing system runs throughout the length of the lavatories and discharges into a septic tank at the Southern end ; water cisterns are placed on brick piers at the North end. The capacity of the system and septic tanks is sufficient to provide for extension of the lines. With the new water supply completed, installation of waterborne sewage for all buildings is being commenced.

South of the Main office is the village which comprises 20 shop houses of two story brick construction and a number of attap shops. These latter await the erection of a market building, which is about to be commenced.

A little further to the South is the village green, the center of Batu Arang athletics, which are comprehensive. Overlooking this is the Asiatic Sports Club building which is managed by an Asiatic Committee with, as ex-officio President, the Mines Superintendent, and as Sports Organiser, one of the European Colliery Officials.

Alongside the village green is the open air Cinema, where the resident population are the guests of the Company on Sunday evenings.

The Company's private road which is $2\frac{3}{4}$ miles long, connects with the Government Road from Rawang to Batang Berjuntai, at about the 26th mile.

Harbor Project at Colombo

Ceylon newspapers report that the Executive Committee of Communications and Works has approved of financial provision being made in the next financial year for preliminary investigations regarding the establishment of deep water quays and oiling jetties in the Colombo Harbor.

The problem of the extension of the Colombo harbor and the provision of deep water quays in it for the purpose of enabling ships to anchor alongside them has been before the Government for many years.

The immediate necessity for reopening the question is the vast progress made in Port Soudan, between Aden and Port Said, and in the harbor of Sabang in Dutch Java. It is pointed out that deep water quay facilities available in these ports offer strong competition to the Colombo Harbor in the matter of coaling as a result of which Colombo is losing a part of her coaling trade. In the Colombo Harbor coal has to be taken to the ship in bunkers while lighters have to be used for loading and unloading ships. The existence of deep water quays will enable shipping companies to save the expenses which have to be incurred in the use of coal bunkers and lighters in the handling of goods.

Several official reports and sessional papers have been published on the subject. The Commission which reported on it, consisting of the Chairman of the Port Commission, the Harbor Engineer, Sir Edwin Hayward and Mr. C. H. Z. Fernando, was appointed in 1927.

The Commission recommended an elaborate program of the extension of the Colombo Harbor. What is now proposed to be attempted is the estimation of the cost of the first part of the program recommended by the last Commission which involves the acquisition and digging up of the area in which is situated the Vagrants' Home and Port Commission Bungalows and probably a part of Fishers' Hill.

It was also urged that the earth obtained from digging up the area might be used to fill up the Bloemendhal Swamp. It was pointed out that if the Government acquired the Swamp it could, after being filled up, be sold as building sites and thus be made a remunerative proposition.

The Development of Gold Mining in Morobe, New Guinea*

By HAROLD TAYLOUR and I. W. MORLEY

(Continued from December, 1933)

THE Morobe Goldfield possibly offers more scope for dredging than any other class of mining. There are extensive river flats along the Bulolo, Watut, Markham, Francisco, Bitoi, Waria and Upper Ramu River valleys, where, if the values are sufficiently high, the other conditions are eminently suitable for dredging, with modern equipment. Bulolo Gold Dredging, Ltd., has demonstrated that the heavy machinery required can be transported by air at a reasonable cost, and there is little doubt that the next few years will see a great increase in the proved dredging area.

Although testing and sampling is in progress in many parts of the field, the only company operating dredges is Bulolo Gold Dredging, Ltd. This company holds some 2,400 hectares of dredgeable ground, in which it has proved about 100,000,000 cu. yds. of gravel. This is divided into two areas: the "Bulolo," on the Bulolo River flats between the upper and lower Bulolo River gorges, where there are some 40,000,000 cu. yds., and two dredges operating; and the "Bulwa," on the Bulolo and Watut River flats, both above and below the Bulolo-Watut River junction, where approximately 60,000,000 cu. yds. have been proved, and two further dredges are under construction. These flats were tested by various interests prior to 1929, but, in the absence of cheap transport from the coast, no effective scheme of development was formulated. The engineers of Placer Development, Ltd. (the parent company of Bulolo Gold Dredging, Ltd.) in 1930 successfully solved this problem by deciding to use large freight-carrying aeroplanes, and sectionalize their machinery down to a maximum weight of 7,000 lbs. The Bulolo area consists of river flats, and was tested by a series of widely-spaced lines of holes at right angles to the river channel. Along these lines the holes were fairly closely spaced. This area has an average depth of approximately 22 feet.

The operating company, Bulolo Gold Dredging, Ltd., was then formed, and constructional work commenced early in 1930. An aerodrome, some 1,000 yards by 300 yards, was cleared and levelled. In April, 1931, the first cargo was carried in by the G. 31 Junkers aeroplanes, and the major construction work advanced rapidly. During these initial stages a small steam plant was used to supply power. The main power plant operating the dredges is hydro-electric, and situated at the foot of the upper gorge on the Bulolo River, at the southern end of the property. Simultaneously with the dredge construction this power plant and transmission lines were installed, and in March, 1932, the first dredge commenced digging.

The two dredges on the Bulolo area are identical, being modern Californian type all-steel dredges, each with 64 close-type managnese steel buckets, having a capacity of 10 cu. ft. per bucket. The bucket line is driven through belt and gearing by a 200 h.p. motor. The screen is 38 feet 7-ins. long overall, and seven feet in diameter. It is made of perforated manganese steel plates, with $\frac{1}{4}$-in., $\frac{5}{16}$-in., $\frac{3}{8}$-in. and $\frac{1}{2}$-in. holes. The stacker is 100 feet long, the belt being 38-ins. wide. There are 20 thwart-ship sluices, 10 on each side, fitted in part with steel riffles of the Hungarian type, and in part with angle iron riffles. Mercury wells are also provided. The thwart-ship sluices discharge into six longitudinal sluices on each side. The dredges are operated on spuds. Two 12-in. pumps provide water for washing the gravel. The dredges have a maximum digging depth of 28 feet below water-line. The various parts are interchangeable between the two dredges. The hulls and structural framework were supplied by Messrs. Poole & Steele, Ltd., of Sydney, whilst the bucket lines, screens, etc., were furnished by various American firms.

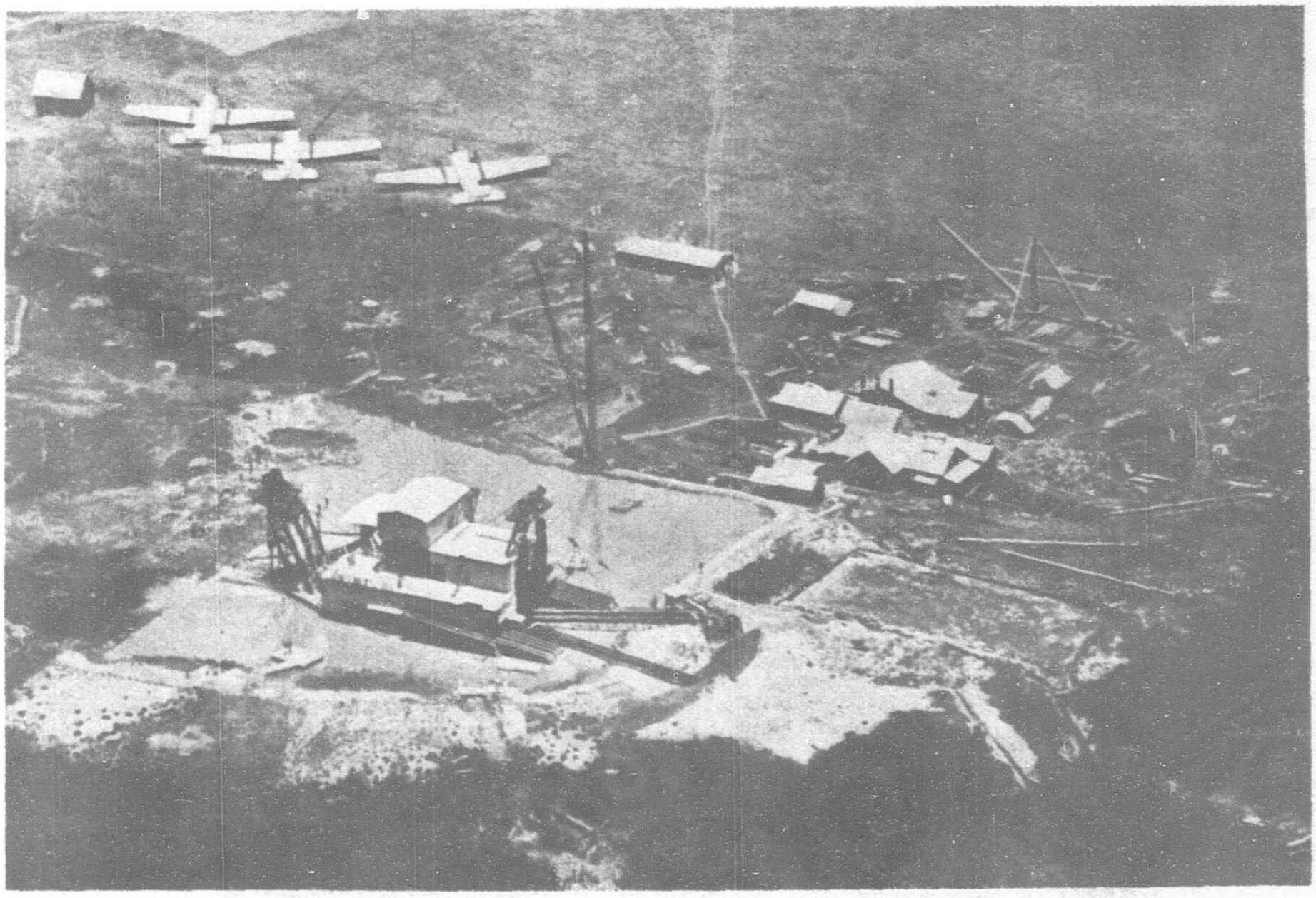
Estimates were originally prepared on the basis of 150,000 cu. yds. per month per dredge. The ground has been found so easy to dig that they are now handling up to 240,000 cu. yds. per month each. When operations first commenced, a little difficulty was found in amalgamating the concentrates, owing apparently to a coating or film on the gold surface. This has been overcome by grinding the concentrates in a small Chilean mill. The gold is smelted and shipped as bullion bars. To date the dredges have been working in the lower-grade sections of the dredging area. Since the commencement these dredges have dug for approximately 82 per cent of the possible time, and are recovering about 95 per cent of the gold content of the gravels.

The Bulwa or northern area is being rapidly developed. A road and power line have been constructed from the Bulolo aerodrome to the new Bulwa aerodrome. below the Watut River junction, and actual dredge construction will shortly be commenced.

Ore Mining

(i) *Prospecting.*—Veins and orebodies have, to date, only been discovered in the Wau-Edie area, though promising indications have been found in the Upper Ramu River area.

*Abstract of Paper presented to the Institution of Mining and Metallurgy for discussion by correspondence and in anticipation of further discussion at a Meeting in the ensuing Session as published in *The Mining Journal*.



Aerial view at Bulolo showing the first completed dredge, the working and part of the aerodrome. All equipment was carried to the site, 2,250 feet up and separated from the coast by 50 miles of tropical jungle and a mountain range, by the aircraft seen in the background

Lode-prospecting naturally follows the discovery of alluvial wash, and although in many cases the finding of the veins is accidental, systematic costeaning from the point where the gravels, when traced upstream, cease to carry values often reveals veinstuff. Over the Edie Creek plateau, in the virgin bush, the surface soil is covered with a thick layer of moss and humus, which adds to the difficulty of prospecting. The known veins all contain an appreciable quantity of quartz, and, since the country-rock over the greater part of this area is a soft "mudrock" (metasomatised schist or slate), many acres have been tested by means of an iron bar, which is "jumped" down. The hard, gritty quartz, if present, can be felt with this bar, and if it is not, it may be fairly safely deduced that there are no veins present. Should quartz be felt, a series of costeans, pits, and small adits are put in to open up the deposit. Valuable indications are often obtained from landslips (very common in this country of steep mountainous slopes), and fallen tree roots (the Day Dawn vein was discovered in this manner). In fact, apart from these and occasional places in the creeks, there are very few exposures of country-rock. The veins near the surface are usually oxidized, and can be roughly sampled with dishwashings.

(ii) *Day Dawn (New Guinea), Ltd.*—This company and New Guinea Goldfields, Ltd., are the only two organizations at present actively engaged in vein development and mining. The leases are situated on the Merri Creek. Several veins have being explained, the chief of which is the Day Dawn. This consists of iron-stained friable quartz, with a little black oxide of manganese, in a slate country-rock, which is much weathered near the surface. On the lower levels the quartz is harder, the vein little oxidized, and heavily mineralized with pyrites. The gold is free, and mainly associated with the quartz, though some of the pyrites carries a little gold intimately associated with it. The vein has been developed by means of a series of adits down to a depth of 305 feet below the highest outcrop. The adits are, wherever possible, driven on the orebody, and are connected by a series of rises, at 50 feet intervals, which act as passes for ore and mullock. The orebody stands well, and the drives are timbered throughout with rough bush "clap-me-down," sets, approximately four feet by seven feet in the clear at four feet centers, with a little lagging where required.

Development and mining is done by European miners, on the daily wage system, with gangs of native laborers. Timber is supplied at the adit-mouths, and in some instances cut for the miners; usually, however, they frame and stand their own timber. The drives are equipped with 9 lb. steel rails, and tipping trucks of 10 cub. ft. capacity are used. All drilling is done with hand steel, at which work the natives soon become adept. The ore breaks easily and requires little "spalling." The major proportion of the mill ore, to date, has been drawn from an open-cut. The outcrop was some 10 feet wide, and, as the cut advanced, the orebody widened to 25 feet. The cut has been carried down from the surface to the 140 feet level in a series of three benches, and into the hillside for some 150 feet. The vein dips at about 75°, and the greater part of the hanging wall has to be removed to make a safe working face. Both the ore and overburden at this point are very soft, and require practically no shooting; it is broken down with bars and picks, and the ore rilled into passes, while the overburden is trucked to the dump. A gang of ten natives under one European can readily break and truck 50 tons of ore per day, in addition to removing the overburden. This open-cut is reaching the economic limit to which it can be carried, and shortly all the production will be drawn from the stopes. Stopes have also been opened up in the mine, and the ore is broken in a series of rill stopes, for which method it appears very well suited. The ore is drilled with breast holes and occasional uppers, and rills direct to the passes. After each lift the stopes are mullocked with surface spoil, which is distributed from the passes by shovelling. Where the walls or back are weak, stulls and toms and headboards, or occasionally rough sets, are used. The total quantity of timber thus consumed is relatively small. In the wider stopes it is proposed to use a system of "bulks," and close-filling to reduce the timber consumption. A development policy is now being formulated for this property, involving the sinking of a main shaft, and exploration of the orebody at depth.

(iii) *New Guinea Goldfields, Limited—Edie Creek.*—This property has also been developed mainly by adits, though two main shafts are now being sunk to explore below water-level. This section of the company's activities has not yet reached the producing stage, but metallurgical experiments are being conducted with a view to designing a mill suitable to treat this ore.

During the two years ended June 30, 1932, this organization has done some 9,500 feet of driving and crosscutting at Edie Creek. In the course of this work they have developed three major vein systems, and several minor occurrences, in all proving a very considerable tonnage of payable, readily mined ore. They have also sunk two main shafts—No. 1, to 369-feet, and No. 4, to 379 feet (as at December 31, 1932), which will serve for hoisting ore as well as further development. The veins in this locality consist of sugary to hard iron-stained quartz, and a considerable proportion of the black oxides of manganese, and in some instances calcite, and rhodocrosite, which, in addition to a good gold content, are highly argentiferous. The country rock is mainly "mudrock" (metasomatized slate or schist), intruded, in part, with a new weathered porphyry. Driving and sinking in this class of ground is comparatively easy, and a great part of the work is through "picking" ground. Where the rock is harder, hand steel and "jumper" bars are used. The veins stand well, but the mudrock has a tendency to "wind." The vein-channels form a drainage system for the surface water, which occasionally makes the ground treacherous. The drives are timbered with rough bush "clap-me-down" sets and well lagged. The work is done on the contract system by European miners with gangs of native laborers, who do all the cutting and framing of the timber. Wooden rails are used exclusively, except at sharp deviations in the tracks. End-tipping trucks of 10 cub. ft. capacity are in use for removing the spoil. All the main levels are connected with the shafts, and with one another, by a series of rises and winzes which, like the drives, are usually carried on the ore.

The main shaft (No. 4) is situated near the summit of the outcrop of the main vein, Edie Lode No. 2, which has been developed for a depth of some 400 feet, and for a total length of over 2,500 feet. It consistso f three compartments, each four feet by four feet in the clear, lined with 10-in frame sets placed at five feet centers. It is equipped with a geared electric winch, by Fraser & Chalmers, Limited, of 20 h.p., capable of hoisting 1,500 lb. (including the bucket or cage) from a maximum depth of 550 feet (with a 9-16-in. rope) at a maximum speed of 300 feet per minute. This winch was especially designed for aerial and native carrier transport, and is the first winding engine to be installed in the Territory.

No. 1 Shaft will serve to explore Edie Lode No. 1 at depth. It consist sof two compartments, each four feet by four feet in the clear, and is timbered partly with box timbering, and partly with standard frame sets. Is is now some 200 feet below waterlevel, and is the deepest working on the field. It is making some 3,000 gallons per hour. The water is handled with compressed air pumps, the air being supplied from a Holman electrically-driven compressor of 225 cub. ft. (nominal) capacity. Electric station pumps are to be installed in this shaft, and it is now being equipped with an electric winder similar to that on No. 4 Shaft.

The method of mining for the ore developed in this locality has not yet been decided, but it will probably be some form of rill or flat-back stoping, combined with timbering and close filling. The surface mudrock will provide suitable filling, and can be cheaply quarried.

(iv) *New Guinea Goldfields, Limited—Golden Ridges.*—At Golden Ridges, on Namie Creek, this company have developed some 100,000 tons of 100s. (nominal prices) ore, which lies in a flat make, close to the surface, and has proved eminently suitable for open-cutting. This ore was first exposed by adits and costeans, and, owing to the heavy forest growth covering it at this time, its true nature was not at first realized, the assumption being that it was a very wide vein. When its form was appreciated, it was proved by a series of pits sunk at the intersection of co-ordinates forming 80 feet squares. These were sunk through the orebody and the ore sampled in five feet vertical sections. The average thickness of ore proved was about 18 feet, and of overburden covering about 20 feet. The overwall consists of a much altered clayey breccia. The ore is composed mainly of the black oxides of manganese, some quartz, and a certain proportion of decomposed porphyry and volcanic breccia. The pits were timbered with rough frame sets and lagged where necessary. They were sunk to depths of over 80 feet by the use of hand windlasses. A portion of the orebody was covered with over 70 feet of overburden. This section was proved by a series of winzes and rises from drives and crosscuts driven in the ore from a low-level adit.

The overburden is now being removed by hydraulic sluicing, assisted with a little shooting to loosen the ground. The orebody exposed is being mined by means of drag-scrapers, a cheap and efficient method for this class of deposit. The drag-scraper equipment was supplied by the Underfeed Stoker Co., Ltd., and two complete sets are installed for working different parts of the orebody simultaneously. The winches consist of two drums for the forward and return ropes, gear-driven by a 40 h.p. motor. St. Clair type buckets (1 cub. yd. capacity) are connected directly to the ropes, which are supported by means of a series of tail pulleys and swivels. The winches are anchored at the rear, but are free to swing in an arc on sets of slide rails. The capacity of one such installation is 100 tons per six hours. The buckets are fitted with manganese steel teeth, which may be reversed. Other wearing parts are also replaceable. The winches are situated at the rear and slightly to one side of the crude-ore bin, to which the ore is dragged and tipped. The ore requires little shooting, and is being mined in a series of benches. One European is able to operate the winch and supervise a small gang of natives working on the benches.

(v) *General.*—A fair amount of exploration work has been done by New Guinea Developments N.L., at Edie Creek. This company has now forfeited its leases. The values and quantity of ore exposed in them did not appear sufficient to warrant further expenditure. New Guinea Goldfields, Limited, have opened up several prospects in various parts of their properties, but, except on those above mentioned, have not done extensive work. Near the head of Little Wau Creek a number of leases have recently been taken up, and prospecting has shown favorable indications. In the Upper Ramu River area options have been taken over a number of gold mining leases, and development work is to be commenced in the next few months.

Metallurgical Practice

To date, only two properties have mills operating on the goldfield. They are treating ore of different characteristics, one rather free-milling the other somewhat refractory, and they provide excellent illustrations of the metallurgical problems encountered on this field.

The plant of Day Dawn (New Guinea), Ltd., at Edie Creek is treating a free-milling ore in a comparatively simple manner. The ore consists of friable quartz, with some oxides of manganese, and carries a high gold content. It is crushed and amalgamated in a Taylor's Empire mill, built by Babcock & Wilcox, Ltd., of Sydney. Two units are installed, each capable of treating some 35 tons of run-of-mine ore per 24 hours.

The ore is trucked from the mine and tipped into two small bins (each of 75 tons capacity), from which it is drawn and passed over a grizzly, and the over-size crushed in a small jaw breaker to about 2½-in. ring, the under-size passing to the central feed distributors of the mills. The mills follow the principle of the old type of Chilean mill, being "edge-grinders." The mill is 12 feet in diameter, and consists of six 42-in. diameter crushing wheels, shod with manganese steel tyres, which in the older models are connected through shafting and trunnion bearings to a central boss, which is revolved at 8 r.p.m. The wheels run on an annular manganese steel crushing bed, which has concentric with it, on the outside edge, a small amalgamation trough or well. The crushing weight consists of a steel tank, which may be loaded up to 10 tons, depending on the hardness of the ore treated. This is supported on springs, which, in turn, rest on bearings on the shafts of the crushing wheels. The ore from the central distributor is fed by a series of launders to the front of the crushing wheels. The more recent models of this mill have been somewhat modified, with the result that the power consumption on a normal quartz ore has been reduced from 16 to 14 h.p. The grinding wheels are now free to revolve on their shafts. This tends to give the tyres a longer life. The feed distributors have been improved to minimize the "splash" and loss of amalgam. The second unit erected by this company cost approximately £2,500, of which some £1,200 were expended in freight.

The unique feature of this type of plant is that in the one machine the processes of crushing, grinding and amalgamating are carried out. Sizing tests have shown 70 per cent of—100 mesh after crushing during normal running. The ore is crushed wet, and approximately 75 per cent of the recovered values are obtained from the amalgam in the mill well. The front of the mill is fitted with screens, through which the pulp discharges, the height of discharge being adjusted by baffle plates, constituting an overflow discharge. As a result of the wave action set up by the wheel travel, a classifying effect is also obtained. Experiments have been carried out with various sizes of screens, the aperture naturally determining the capacity of the mill. A 20-mesh screen has been found most suitable for the class of ore treated. The pulp from the mill discharges on to copper amalgamation plates, where approximately 23 per cent of the total recovered values are obtained. The tailings pass over blanket tables, and a concentrate, which is treated in a large Berdan pan, is collected, which gives the remaining 2 per cent of the recovery. An overall recovery of some 75 per cent of the total values in the ore is obtained. When crushing clean quartz there is very little slime produced by this mill. The sands from the blanket tables are run to a dam for storage and possible future treatment. Only a small proportion of the silver content of the ore is recovered, but it is not considered economic, at this stage, to add further appliances to recover it. Investigations are, however, being conducted and at a later date a small cyanide plant may be installed. This will be designed to recover the silver. The tailings at present accumulating will also be retreated in this plant. The ore on the lower levels is somewhat refractory, and will require cyaniding.

The only cyanidation plant at present operating is that of New Guinea Goldfields, Ltd., at Golden Ridges. It has a normal capacity of 100 tons per 24 hours, and is electrically operated. The ore consists of quartz and the oxides of manganese, and contains a considerable proportion of clayey decomposed porphyry and volcanic breccia. The gold, which is fairly fine, is intimately associated with the manganese oxides. Preliminary investigation showed that the ore was somewhat difficult to treat, mainly owing to the high percentage of clay. Exhaustive tests were carried out in America before the plant was designed. Following these tests the plant was designed by the General Engineering Co., Ltd., of Salt Lake City, Utah. The principle decided on was coarse-crushing to 2½-in. ring, drying to about 150°C., fine-crushing to 8-mesh, leaching in shallow vats by percolation, and precipitation of the gold from the resultant solutions by zinc shavings. Owing to the refractory nature of the ore, it has been found advisable in practice to make certain modifications to the design in order to obtain a higher economic recovery.

In the plant, as erected, the ore is drawn to the crude-ore bin (150 tons capacity) by means of drag-scrapers, and tipped on to a grizzly with a 2½-in. opening. Oversize is fed to a small Sandycroft Blake-type breaker, driven by a Tex rope drive; undersize gravitating to the bin. Ore from the bin is drawn off on an 18-in. belt conveyor, by Spenser (Melksham), Ltd. This delivers the crude ore to an A.12 Rotary Dryer (Edgar Allen & Co. Ltd:), wood-fired furnace (by Heenan & Froude, Ltd.). The ore is passed through the dryer to the boot of a hot-ore elevator (Spenser, Melksham, Ltd.), at the head of which are situated double-deck Sherwen screens (Fraser & Chalmers, Ltd.). The undersize falls into a fine-ore bin of 100 tons capacity. Oversize from the bottom deck (8-mesh) passes through high-speed rolls, and returns to the elevator boot; oversize from the top deck (½-in. mesh) is fed to a small Hadfield's granulator, and also returns to the elevator. The ore from the fine bins is drawn off as required, and tipped into steel vats (a battery of eight, each 25 feet in diameter by 5 feet deep). A truck-way is provided from the fines-bin to take the 10 cu. ft. capacity side-tipping trucks. Each tank has a capacity of some 75 tons of ore, and a seven-day circuit is used. Lime obtained from a local deposit and burnt in kilns of beehive-type, is added. The cyanide solution is added and drawn off by means of a vacuum pump. The sands are sluiced from the vats and run to waste. The cyanide solution is clarified by means of Butters leaf filters, and passes into zinc-shaving precipitation boxes. The precipitate is washed, smelted and cast into bullion bars.

Power

Prime movers for mining use have only been installed during the past two years. Previously the development of the field had not warranted their introduction, especially in view of the comparatively high air freights.

Steam Power Plants have been erected by the three major companies operating in the district. The abundance of wood for fuel has made them eminently suitable plants in the initial stages

of development. Unfortunately the wood available is of low calorific value, and, although there are ample supplies, the difficulties of delivery to the plant, owing to the rugged terrain, and to stations using large quantities, militate against any large increase in steam-driven prime movers, especially in view of the potential hydro-electric power available.

For the construction work on the first dredge, before their hydro-electric plant was completed, Bulolo Gold Dredging, Ltd., installed three 45 h.p. (nominal) vertical tubular boilers manufactured by the Ocean Shore Iron Works, San Francisco. These boilers have a grate area of 9.58 sq. ft., and are designed for a working pressure of 125 lb. per sq. in. They were transported from the coast in the large G.31 Junkers aeroplanes in one piece, save for the stacks and fire-box. The total weight of each boiler assembled approximates to five tons. This is a very quick-steaming type of plant. They were fired with wood fuel, mainly waste from the wood-working plant and sawmill. The steam was used to operate three 45 h.p. and one 20 h.p. high-speed vertical compound engines (marine type—non-condensing). The power developed was used to operate compressors, lathes and an ice plant. This battery of boilers is to be re-erected near the main hydro-electric plant, and will be used to operate a small engine and electric generator to feed into the main transmission line in the case of a breakdown of the hydro-electric plant.

Day Dawn (New Guinea), Ltd., is operating a 100 h.p. (nominal) Babcock & Wilcox wood-fired boiler specially designed for the altitude and for transport by native carriers. The boiler works at a pressure of 150 lbs. per sq. in. Water is supplied from a race connected to Mystery Creek (a tributary of the Merri Creek). There is no condenser. Fuel, in the form of cord wood, is brought to the plant by means of a small aerial ropeway and trucks from the slopes of the Merri Creek valley. Steam is supplied to a 60 h.p. Belliss & Morcom high-speed vertical compound engine running at 660 r.p.m., also to various pumps, and a small engine running a lighting set. From the main engine there is a belt-drive connecting to the milling units and other machinery. Electric light is provided in the main adits of the mine.

New Guinea Goldfields, Limited, has erected a small steam plant on Kunai Creek, near Wau, and from this center electric power is distributed to its main centers of operation—Edie Creek, Golden Ridges, and Wau. The plant consists of two Sissons-type water-tube boilers, fitted with superheaters and wood-fired. Steam is produced at 175 lb. per sq. in. and 550°F. of superheat. These boilers have a nominal capacity of 200 h.p. each. They are operated on natural draft, and are very quick steaming. Steam is supplied to feed pumps, and a Belliss and Morcom high-speed reaction turbine (6,000 r.p.m.) fitted with automatic governing gear. The turbine is coupled through gearing (2 : 1) to a 300 kw. Lancashire Dynamo Co. 50-cycle, 440-volts, three-phase alternator, complete with exciter. Waste steam is passed to a Belliss and Morcom jet condenser, and returned to the feed-water tank. The condenser operates under 25-in. of vacuum. Make-up water is added from the supply tanks as required. For the condenser some 15 cusecs of water are drawn by a race from Kuani Creek. The current generated by the alternator passes to a station switch-board and is distributed to the transformers. It is stepped up to 6,600-volts and transmitted at that pressure to Edie Creek and Golden Ridges. The line consists of three copper conductors and a galvanized steel "earth" wire.

The erection of the transmission line to Edie Creek was a work of considerable magnitude. The power house is situated at an elevation of some 4,000 feet and the Edie Creek distribution center is at about 7,000 feet, the line passing over Mount Kaindi at an altitude of approximately 7,500 feet. The total length of this line is about 4½ miles, and it traverses some extremely rough country. A trial survey established a possible route, and all large trees were cleared for a width of three chains along the line. The equipment supplied was designed for 200 feet to 300 feet spans, but the nature of the surface compelled the use, in some cases, of 400 feet and longer spans. Accordingly, instead of single poles with brackets giving equilateral spacing for the conductors, H-poles were used with all the conductors in the same horizontal plane, suitably spaced for windage. A minimum clearance of 15 feet was required, which on 30° slopes required the use of very long poles, a local oak being used. Across the Merri and Edie Creek valleys spans of 1,100 feet and 900 feet, respectively, were made by the use of nsulated steel suspension cables, with insulated "droppers" to the conductors, forming a catenary similar to that in use on electric train supply lines. Electric motors and equipment at Edie Creek consist of two electric winders, an electrically-driven compressor and electric pumps. Electrical storms caused some trouble and interruption to the service during the first few months, after installation, owing to the high altitude. Since the introduction of Westinghouse autovalve lightning arrestors and additional earth plates there have been no interruptions. The current at this center is stepped down to 440-volts to operate the various motors.

The transmission line to Golden Ridges was some 1½ miles long, and over much easier country. Electric power is used at Golden Ridges for lighting, the operation of the drag-line scrapers, and the various motors in the mill and cyanide plant. The current is here also stepped down to 440-volts for the motors, and the phases are split and balanced to supply lighting at 240-volts.

Hydro-Electric

Only one hydro-electric power plant is at present in operation, that owned by Bulolo Gold Dredging, Limited, though several small plants are in course of installation or contemplated by individuals or syndicates. There are vast potential possibilities for economic hydro-electric power generation, running into many hundreds of thousands of available horse-power. As large-scale mining increases on the field the more promising of the many schemes available will undoubtedly be utilized. The small miner will also realize the value of electric power, as on many of the creeks small (up to 100 kw.) plants can be cheaply installed.

Bulolo Gold Dredging, Limited, has erected the largest power plant in the Territory at the lower end of the upper Bulolo River gorge and at the upstream end of their Bulolo dredging area. The plant is of the low-head reaction type. A diversion weir was constructed across the Bulolo River about 1½ miles above the power house site. Two units of the power house are already installed, and the third and fourth are under construction. The units are identical, each consisting of Boving turbines, designed for a maximum output of 1,000 h.p. direct-coupled to 600 kw., 60-cycle, 6,600-volt, three-phase alternators, complete with exciters; the wheels run at 750 r.p.m., and are automatically governed, through voltage and power regulators. The current is transmitted at the generated voltage over aluminium cable conductors to the dredges and main camp, a distance of some five miles. At the camp there are stepdown transformers for supplying power at 440-volts and lighting at 110-volts. Power is supplied for workshops, crane, freezer, etc. The current is conveyed by the overhead conductors to near the dredges, and then through armored cable supported on pontoons across the ponds to the dredges. Since the start-up of this plant on March 15, 1932, it has been comparatively free from breakdowns, and the power has been generated at an average running cost of 0.4d. (Australian) per kwh.

In the lower Bulolo River gorge a partnership in installing an undershot waterwheel coupled to a 25 kw., D.C., Peterson, A.E.G. generator. This will be used to supply power to a 4-in, gravel pump and for general purposes. This generator is of a novel type, since it needs no mechanical governing gear to regulate the voltage, the generator containing as an integral part a series of non-moving resistances (enclosed in hydrogen), which compensate for speed variations and give a steady voltage output within wide speed-limits.

A 45 kw. Pelten wheel plant is being erected on the Lower Edie Creek, which will operate under a head of 250 feet, and supply power for pumps, winches, sawmill, etc., to the lessee of the property.

Gas, Oil, etc.—Small petrol engines have been used by the companies and individual miners for sawmilling, house lighting, and general purposes. The cost of petrol on the field, 6s. to 9s. (Australian) per gallon makes these plants very uneconomic to operate. The air freight also precludes the use of crude-oil engines. The type of timber available is probably more suited for producers for suction-gas plants, than for fuel for steam boilers, but no serious steps have yet been taken to introduce this type of plant.

Transportation

The deciding factor in the development of this goldfield has been the question of transport, and it may be fairly said that if the aerial carriage of material had not advanced to its present

high stage of efficiency, many properties on the field would still be unproductive. Next in importance to the aeroplane has been the primitive native carrier, and the territory is fortunate in having an abundant supply of such cheap labor, which is eminently suited for carrying and other manual work. The majority of the independent miners are now within a day's march of an aerodrome, and are able to send their own laborers to carry stores from the depots at the 'dromes. Of the some 3,700 indentured laborers employed on the goldfield, it is estimated that at least 500 are constantly engaged in carrying. It is extremely doubtful if the native carrier will ever be eliminated in this field. It is a comparatively cheap method of transport, each native costing from 2s. to 3s. per day, or say 8s. to 10s. per ton (2,000 lb.) mile, allowing a march of 10 miles per day. The prospector with his team will always naturally rely on them to carry his supplies, and it is very unlikely that tracks for animal transport will ever be constructed to some of the more outlying camps.

The possibilities of animal transport (mule or horse) have naturally been considered since the earliest days, and several attempts were made to run a regular pack service from the coast. Pack animals have been found most useful for subsidiary carriage from the aerodromes to the mining camps, particularly from Wau to Edie Creek. In all, some 50 horses and mules are in use in this service, carrying at an average rate (Wua to Edie Creek) of 1d. per pound. Proposals are under consideration for the making of a number of graded foot and mule tracks to other centers from Wau ; these will extend the use of animal transport, though, should several motor roads that have been suggested be constructed, particularly from Wau to Edie Creek, the use of animals will be rather restricted.

At the present time there are only two roads in existence suitable for motor transport. They are from the power house of the Bulolo Gold Dredging, Limited, to the Bulowat aerodrome, about 16 miles, and from Wau to Golden Ridges, about 4½ miles, both constructed by interested mining companies for the transport of their own heavy machinery.

Aerial Transport

This field has demonstrated the advancing technique of modern flying, the practicability of commercial aviation under adverse weather conditions, the fallacy of requiring immense expanses of flat country for the landing of large-size aircraft, and the possibilities of landing heavily loaded 'planes on aerodromes at high altitudes in a rarefied atmosphere, often coupled with steep gradients on the 'drome surfaces. The natural features, i.e., the high mountain ranges between the coast and the Bulolo River valley ; inconsistent meteorological conditions, in particular the sudden fall of the barometer after noon ; the intensified cloudiness a certain seasons, causing poor visibility ; and the complex air currents due to the tropical atmosphere and topography, all tend to make flying difficult in this country, and the fact that it is carried on without the aid of meteorological stations speaks well for the efficiency of the high-powered engines and aeroplanes as well as the skill of the pilots. Aviation in the Territory is under the control of the Civil Aviation Authorities of Australia, and all machines are subject to rigid periodical inspections.

As will have been realized, the aeroplane has been of paramount importance in the development of the field. After the initial flight in 1927, the possibilities were rapidly exploited, and the organization has grown to such an extent that to-day Lae is claimed to be the busiest air-port in the Southern Hemisphere, and the aerial transport of passengers and cargo to the goldfield represents the biggest aerial transport business in the world.

Originally the machines in use were simple, open-cockpit, passenger, biplane, fabric machines. It was found that these were not economical freight carriers, and the all-metal, single-engined, low-wing Junkers W. 34 monoplanes, which will carry up to 1,800 lbs., were introduced. These machines had the advantage of not requiring hangars. Machines of all types have been used on the field, both metal and fabric monoplanes and fabric biplanes. In all some 41 machines have been flown on the field. Experience showed that, with careful servicing, fabric machines were able to withstand the rigors of the tropical climate as well as the all-metal planes. The cabin type of machine is now most common for work on the larger aerodromes, but the "Moth" type has a useful field on the smaller 'dromes and landing grounds. The introduction of the three-engined all-metal G.31 Junkers monoplanes in 1931 opened up further possibilities, as each plane has a pay load of up to 7,000 lbs., and has transported up to 200 tons per month each, at a cost—to Bulolo Gold Dredging, Ltd., who owned the planes, but had them operated by Guinea Airways, Ltd.—of 2.5d. (Australian) per lb.

The aerial companies will undertake the freightage of any class of cargo (machinery, stores or animals) weighing not more than 7,000 lbs. and not greater in size than 24 feet long by 77-ins. wide by 69-ins. high (the size of the cargo compartment of the Junkers G.31). All the usual mining equipment, from the primitive pick and shovel to dredges, powerplants and treatment mills ; and motor-cars, pianos, billiard tables, cattle, etc., have been successfully carried to the field.

As practically every person on the goldfields, some 600 Europeans, has travelled at least once by aeroplane, and sees them loading and unloading daily, residents of the field may rightly claim to be the most air-minded people in the world.

The service has been remarkably free from serious accidents. Some dozen aeroplanes have been wrecked through one cause or another, but except for two cases, the injuries to those flying were minor. One life was lost in May, 1931, when a Junkers W.34 was lost in the clouds and crashed into a mountain near Zenang, and at Christmas, 1932, two lives were lost in the unfortunate crash of a Gypsy Moth on the Wau aerodrome.

All the initial flights were made from Lae to Wau, at both of which places suitable aerodromes were easily made ; later, the services were extended to Bulolo, Bulowat and other minor 'dromes, and the aerodromes at Salamaua and Port Moresby were constructed. During the past year the number of smaller aerodromes and landing grounds has been considerably increased, and at present there are 18 aerodromes in the Morobe District, one in the Madang district and three in Papua. A regular air service has been established from the field to Port Moresby in Papua to meet all steamers, and the trip from Wau to Sydney, or return, can now be made in six days.

Numerous companies, and individuals, have flown aeroplanes on this field, but at present there are only four concerns engaged in the business, operating 17 machines in all with a total cargo-carrying capacity of 35,210 lbs.

An inter-aerodrome service is maintained between all the following aerodromes, at reasonable rates : Salamaua, Lae, Wau, Bulolo, Bulowat, Bulwa, Zenang, Surprise Creek, Upper Watut, Kudjuru, Garinia, Wampit, Sunshine (Watake), Marilinan, Babau, Saigon, Kinantu, La Pumpa and Bena Bena (Purari).

Current Situation

In the Morobe district much of the known rich and easily won alluvial gold has been extracted, principally by the "box and dish" miner, and the stage has now been reached where the placers are being actively worked by modern machinery methods. It is estimated that, at the present rate of extraction, upwards of ten years will elapse before the known alluvial gold deposits are worked out. It is reasonable to assume, with the better opening-up of this rugged and partially explored jungle country, that further payable alluvial areas will, from time to time, be discovered by prospectors, and so add to the life of this class of mining.

The mining of the ore deposits is so far confined to the oxidized zone, and while work is in progress to determine the extent and characteristics of the lodes at depth, no forecast can be made as to the probable life of the field, until this information is available.

The mining industry in North-east New Guinea is unique in so far that it is dependent upon aerial transport for supplies and equipment. Although the costs are high compared with those met with on Australian mining fields, they are more or less offset by an adequate supply of native labor and ample water for the generation of hydro-electric power.

Government patrols are progressively penetrating further inland and are bringing under Government influence country now occupied by hostile natives living in the "uncontrolled areas." As this work proceeds, much untried but probably auriferous land is being made safe for the prospector and miner, who establish aerodromes at convenient centers, and work from these as their bases.

The industry is now in a healthy and progressive condition in New Guinea, and there is every indication that it will remain so for some time to come.

Simons Dredgers for the Far East

WELCOME indications of some lifting of the industrial depression is provided by the placing recently of two contracts for dredging plant with the old established firm of dredger builders, Messrs. Wm. Simons & Co., Ltd., of Renfrew. These orders form a gratifying addition to the small volume of shipbuilding work placed on the Clyde within recent months and are particularly welcome to Renfrew, which has been severely hit by the circumstances of the present times.

One is for a 27-in. Cutter Suction Reclamation Dredger to the order of The Burmah Oil Company, Ltd.

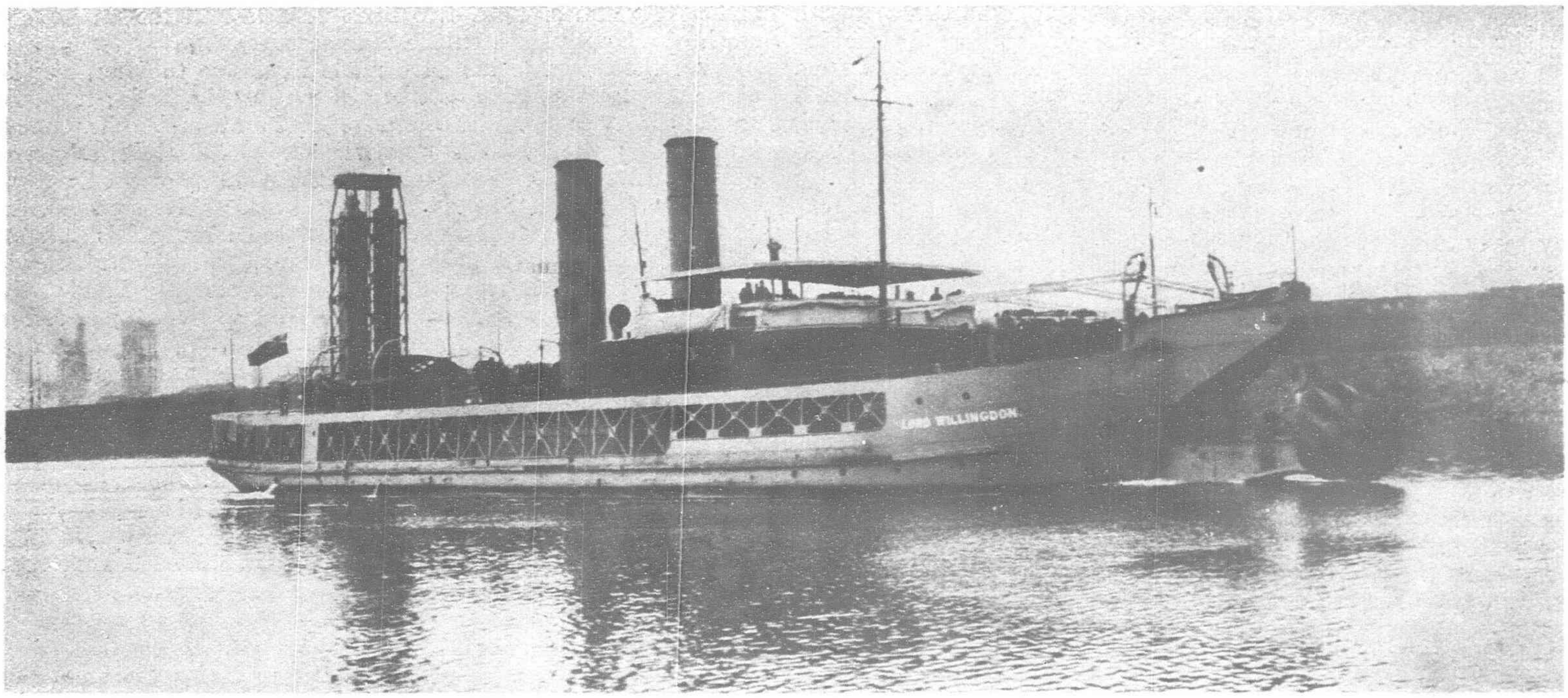
This vessel is destined for river service in Burmah where we understand she will be employed on an extensive reclamation project which the Owners have on hand. Work is to be carried out continuously on this project over a number of years and it is anticipated that the dredger will be operated on a 24 hours per day three-shift basis.

Machinery of over 3,000 b.h.p. will be installed and the dredger will be designed to work to stern spuds and bow swinging moorings. The suction frame will be long enough to dredge to 40 feet depth of water and will be furnished with powerful rotary cutter gear for disintegrating the material.

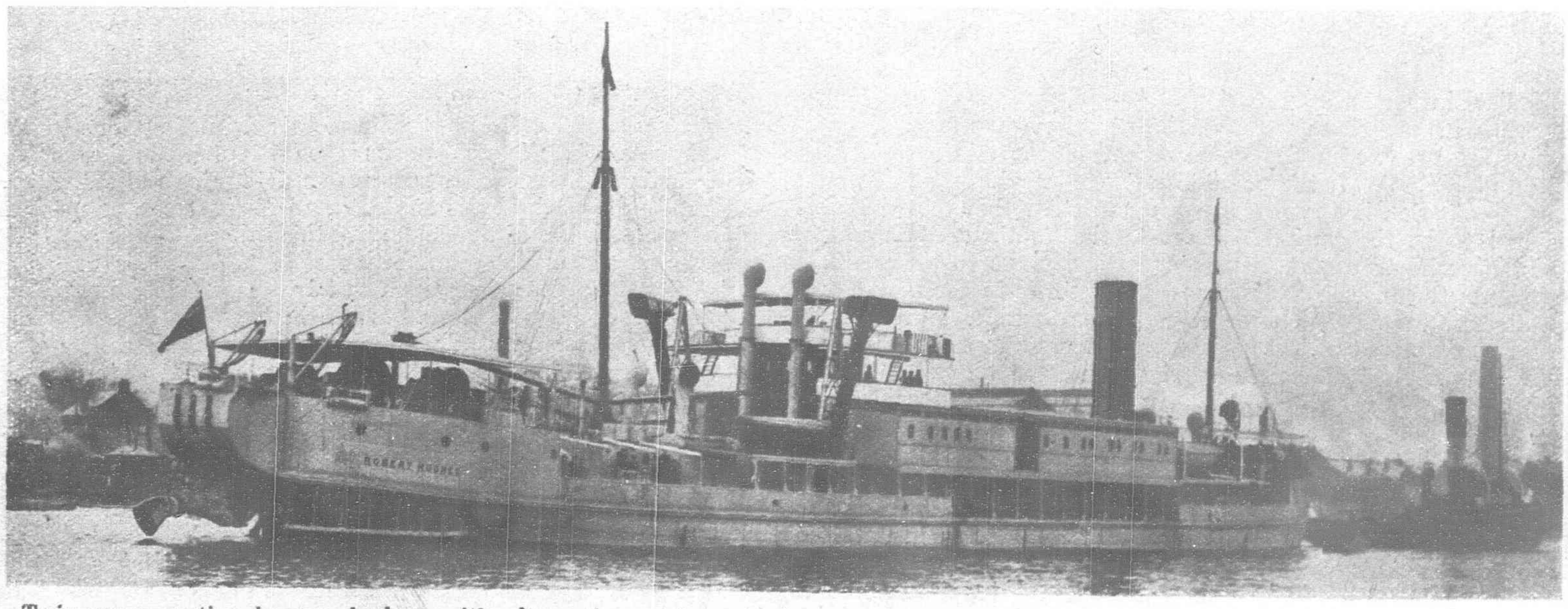
The dredger will be equipped with two pumps of massive construction, arranged to work in series, and designed to deliver some 1,000 tons of solids per hour to an elevation of 38 feet at the end of 1½ miles of floating and shore pipe line.

Each pump will be driven direct by a six cylinder Diesel engine of the four-stroke single-acting solid injection trunk-piston type. The cutter gear and other items of dredging machinery will be electrically driven, the supply being derived from a large Diesel-electric generating set, the auxiliaries will also be electrically

(Continued on page 46)



Showing one type of dredge built by Messrs. Wm. Simons & Co. some time ago for the Government of Madras. It is a twin-screw cutter suction reclamation dredger, dimensions, 203-ft. by 41-ft. by 13-ft. 4-in., dredging depth, 40 feet, contract output 1,500 cub. yds. per hour



Twin-screw suction hopper dredger with alternative equipments for sand suction, for cutter dredging and for dragging, built by Messrs. Wm. Simons & Co.

A Study of Shansi's Rivers*

By O. J. TODD, Chief Engineer, China International Famine Relief Commission

WHEN unusually heavy summer rains fall on the upper watershed of the Fen Ho in Shansi Province the inhabitants of the valley lands near Taiyuanfu and south for 80 miles sustain losses dependent in extent on the stage of the river when exceptional rainfall comes. In the summer of 1932 a flow of 80,000 cubic feet per second caused serious dike breaches not only at Taiyuanfu but in many places to the south especially in the districts of Chiehsiu, Pingyao, Shaoyi and Fengyang. Also in the southern part of the province near Chiangchow the river went far out of its usual bounds.

The south-west corner of Taiyuanfu suffered considerably from this flood since the ground in that part of the city is very low and it was months before all the flood water was removed. But the greatest flood damages were in the lower end of the valley in the Chiehsiu-Pingyao area where many villages were almost completely deluged. They had been built on low ground surrounded with earth dikes. The dikes proved to be inadequate in this emergency.

A lay investigator looked over the ground and recommended that better dikes be built around the low-lying villages and that better waterways be built to lead the small tributary streams from near-by mountains to the Fen Ho thus preventing their overflow and resulting damage to villages built beside them.

My inspection of this country in September and October, 1932, convinced me that the flood problem must be attacked in a larger way than that previously suggested. The Fen Ho needs a first class diking system, or as good as Shansi can afford, from somewhere above Taiyuan to Chiehsiu or below. It also should have reservoirs on the main river, and on its branches where there is lightest silt load, for temporary detention of flood flow. But to what extent such a scheme might prove practical could only be determined after at least a season of field study.

While this topic of flood control was under discussion the Governor of Shansi emphasized the need of a further study of Shansi's water supply with an eye to increasing irrigation facilities, for this province suffers much oftener from drought than from flood.

It was this situation that caused the Shansi Water Conservancy Commission to come into being in January, 1933. With this Commission, composed chiefly of men ranking high in the Provincial Government, progress was rapid. Acting as Chief Engineer on this work I put survey parties in the field in late February and we have pressed the work of surveys and estimates throughout the year. Rarely have engineers in China had better co-operation from the local officials and people than in connection with these studies. The Fen Ho and Sang Kan Ho surveys are practically completed. While reports on these are being issued the Governor asks that the field studies be continued to cover the upper reaches of the Hutu Ho and the Chang Ho. Surveys of these, for purposes of water conservancy, will go forward early in 1934.

The Fen Ho's Storage Problem

In seeking suitable detention reservoirs along the Fen Ho it was found that there are two dam sites above Taiyuanfu 68 miles and 85 miles respectively where the cost of construction would not be excessive. Surveys have been made of these two reservoirs, maps prepared and storage estimates made. Throughout the summer and fall drilling work has gone forward to determine depth of bed rock below the sand and boulder river bed. Decision as to which of these two sites will be used first will be governed by further studies as to first cost of the structures. These dams will have ample sluice-ways with gates to permit the summer flow to pass through without great retardation. Daily silt samples, taken from the main river at Taiyuanfu last summer, gave a maximum load of 23 per cent of solids by weight. This makes storage of summer or early autumn water out of the question. But winter flow with less than one per cent of silt by weight can be stored to augment the low water spring flow and increase the acreage served by the various irrigation systems downstream.

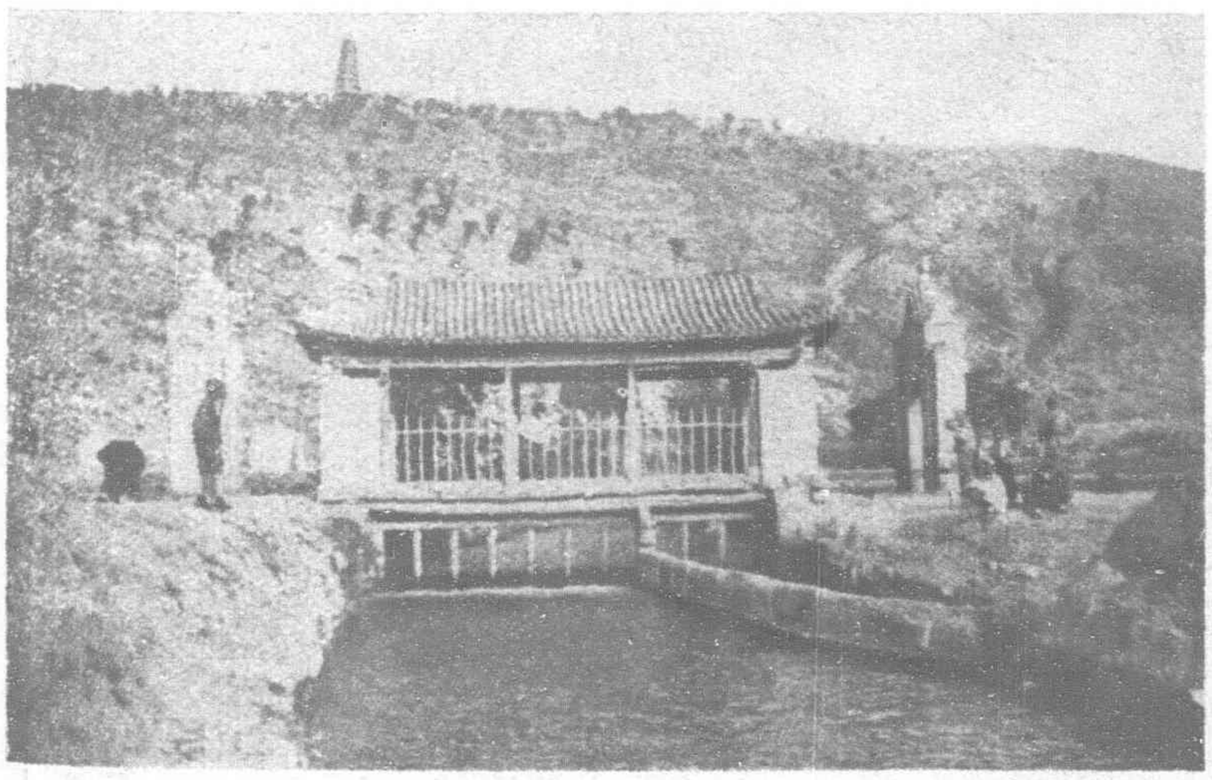
In figuring costs for a dam in this region the great item is cement. There are no suitable roads within 40 miles of this location. Surveys and estimates are being made this winter for a graded motor road to serve this region from Taiyuanfu.

Though no other storage along the main Fen Ho has been considered feasible, due to narrowness of valleys and steepness of gradients, yet two feeding streams have been investigated. The Hsiao Sha Ho, coming in from the south near Chi Hsien, carries comparatively clear water for several months of the year, but our surveys of reservoirs above three proposed dam sites in its gorges show that it does not have economical storage. The gradient of this stream is too great in those stretches where dam sites are found.

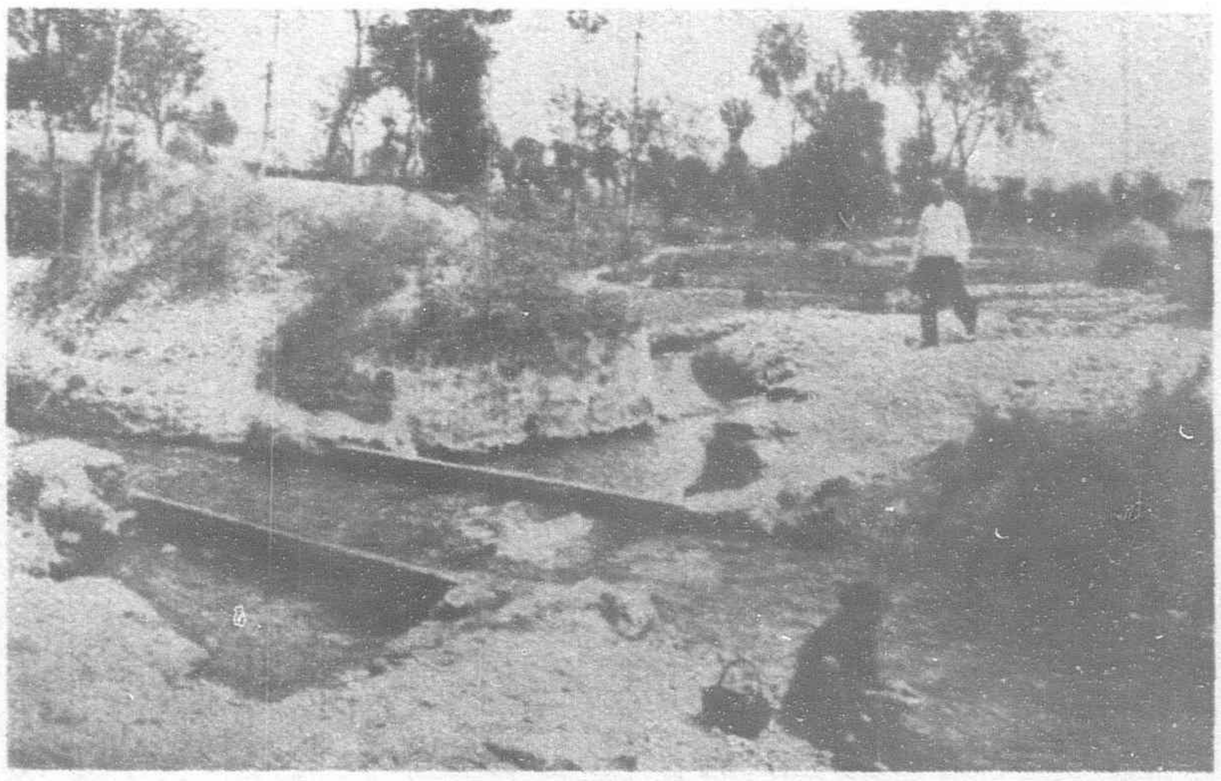
The Wen Yu Ho coming in from the west near Wen Shui Hsien, and almost opposite the mouth of the Hsiao Sha Ho, is a turbulent stream when in flood, but it also has a long period of rather clear flow. One small reservoir site that has been located and surveyed on this river may be utilized to conserve its winter water. Other smaller ones can be developed in later years.

Three springs that feed into the Fen Ho, and are located but a few miles from its main course, have been used for centuries for irrigation and to run small flour mills. They flow with relative

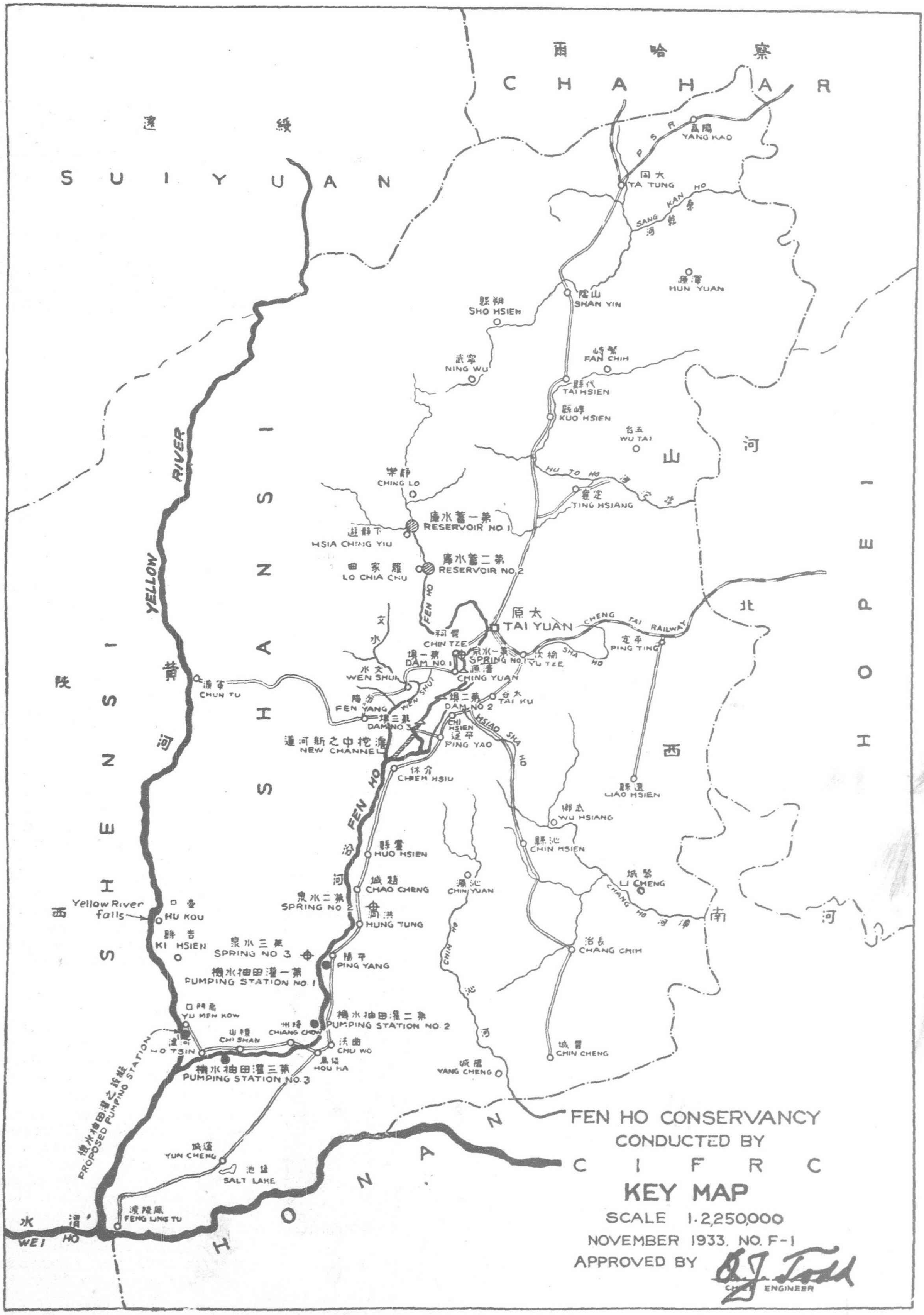
*Journal of the Association of Chinese and American Engineers.



Kwang Sheng Ssu Spring in the lower Fen Ho Valley (90 to 100 second-feet flow)

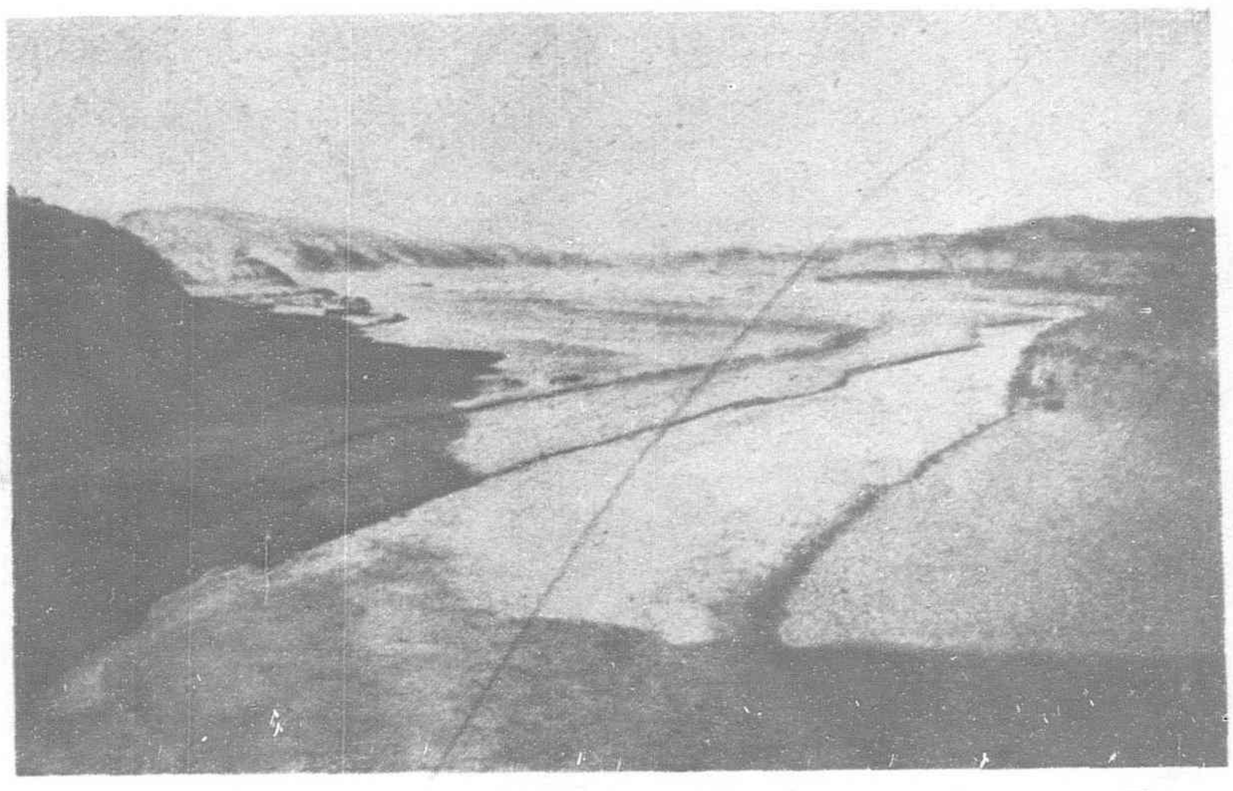


One of the outlets of Lung Tze Ssu Spring in lower Fen Ho Valley (90 to 100 second-feet flow)


CHAHAR
察哈爾
SUIYUAN
綏遠
SHENSI
陝西
SHANSI
山西
HONAN
河南
HOPEI
河北
YELLOW RIVER
黃河
YANG KAO
陽高
TA TUNG
大同
SANG KAN HO
桑乾河
HUN YUAN
渾源
SHO HSIEN
朔縣
SHAN YIN
山陰
NING WU
寧武
FAN CHIH
岢嵐
TAI HSIEN
代縣
KUO HSIEN
嵐縣
WU TAI
五台山
HU TO HO
滹沱河
TING HSIANG
定襄
CHING LO
靜樂
RESERVOIR NO 1
第一蓄水庫
HSIA CHING YIU
下靜遊
RESERVOIR NO.2
第二蓄水庫
LO CHIA CHU
曲家窪
FEN HO
汾河
TAI YUAN
太原
CHENG TAI RAILWAY
正太鐵路
CHIN TZE
晉祠
DAM NO 1
壩一第
SPRING NO 1
泉水一第
YU TZE
榆次
SHA HO
沙河
PING TING
平定
WEN SHUI
水文
CHING YUAN
源清
CHUN TU
河曲
FEN YANG
汾陽
DAM NO 3
壩三第
DAM NO 2
壩二第
TAI KU
太谷
CHI HSIEN
祁縣
PING YAO
平遙
HSIAO SHA HO
小沙河
NEW CHANNEL
道河新之中挖濬
CHIEH HSIU
介休
LIAO HSIEN
遼縣
WU HSIANG
武鄉
CHIN HSIEN
沁縣
HUO HSIEN
霍縣
CHAO CHENG
趙城
SPRING NO 2
泉水二第
HUNG TUNG
洪洞
CHIN YUAN
沁源
LI CHENG
黎城
CHANG HO
漳河
CHANG CHIH
長治
Yellow River falls
HU KOU
壺口
KI HSIEN
吉縣
SPRING NO 3
泉水三第
PING YANG
平陽
PUMPING STATION NO 1
機水抽田灌一第
YU MEN KOW
口門禹
PUMPING STATION NO. 2
機水抽田灌二第
CHIANG CHOW
絳州
CHI SHAN
稷山
NO TSIN
津禾
CHU WO
沃曲
HOU MA
侯馬
PUMPING STATION NO. 3
機水抽田灌三第
PROPOSED PUMPING STATION
機水抽田灌之擬設
YUN CHENG
運城
SALT LAKE
鹽池
YANG CHENG
垣曲
CHIN CHENG
沁晉
FENG LING TU
風陵渡
WEI HO
渭水
FEN HO CONSERVANCY
CONDUCTED BY
C I F R C
KEY MAP
SCALE 1·2,250,000
NOVEMBER 1933. NO. F-1
APPROVED BY
CHIEF ENGINEER



Temporary diversion dam near Chaocheng, Shansi on the Fen Ho River



The No. 1 Reservoir site above Hsiachingyao on the upper Fen Ho River

uniformity throughout the year. One is the Chin Tze spring, 14 miles south of Taiyuanfu, with an average flow of 70 cubic feet per second. It is so located that an empounding reservoir for holding winter flow may be constructed near-by at reasonable cost. The Kwang Sheng Ssu spring in Chao Cheng Hsien has an average flow of 90 cubic feet per second and waters lands in Chao Cheng and Hung Tung Hsiens. A storage reservoir has been laid out to empound the winter flow from this source. This is on the east side of the Fen Ho. Across the river and downstream nearly 40 miles is the Lung Tze Ssu spring. This also has a flow of 90 cubic feet per second. While its flow is well utilized in growing seasons, the winter flow is mostly wasted. A reservoir has been surveyed that would store the winter flow from this spring. The above three springs are valuable adjuncts to the Fen Ho and should be utilized to their utmost capacities.

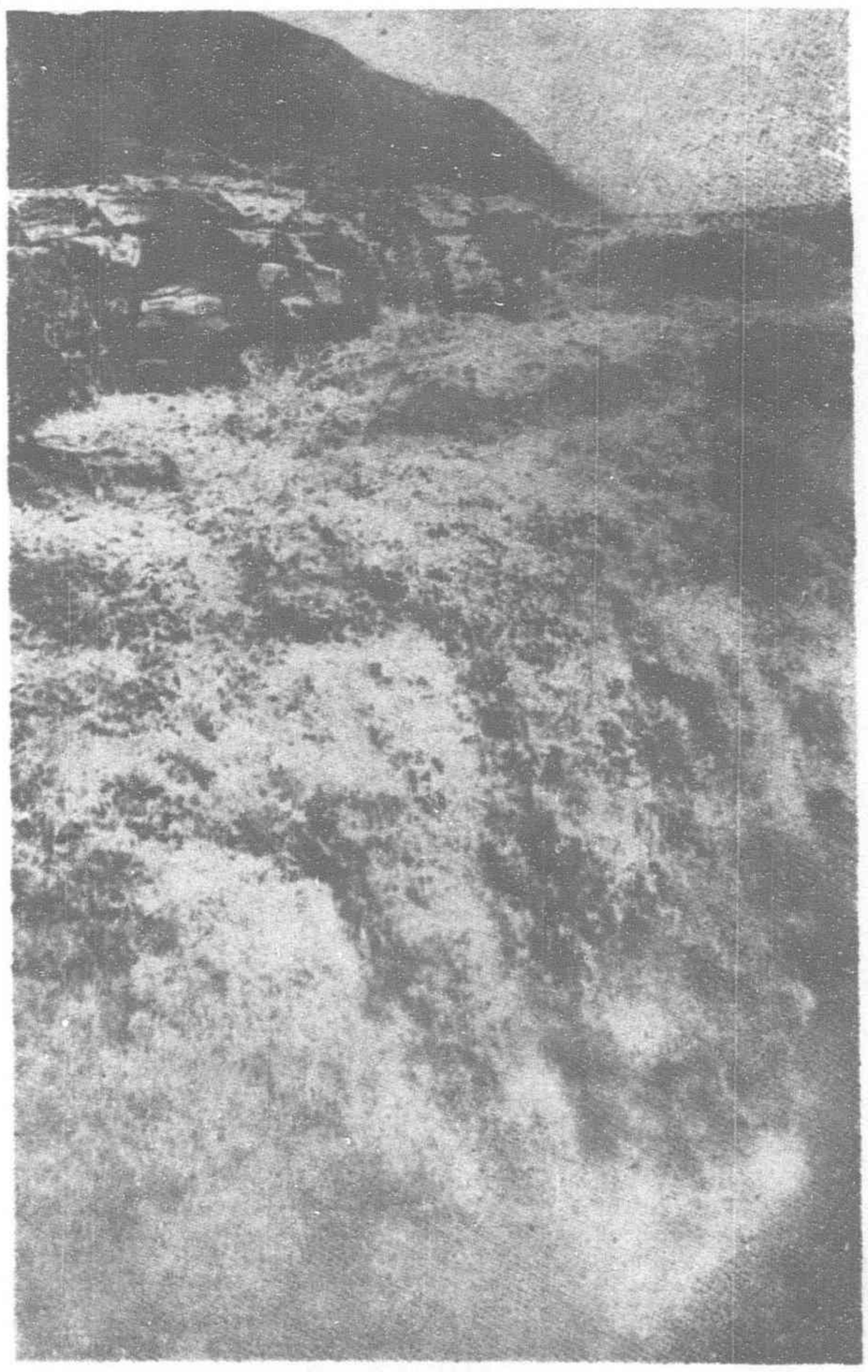
The matter of rights to the water power to run small home mills is an important one. Before these reservoirs can be built this question must be handled satisfactorily. Probably the solution is to be found in allowing the mills the use of the flowing water for one day a week during the winter season when the storage will be taking place. The highest power in the province will be required to settle this point.

Conservancy in its fullest sense has not been considered in connection with the Fen Ho heretofore, it would appear. But our studies show that it is highly practical to cut down wastes in the case of all Shansi's large springs as well as on the main river when silt content is low.

Diversion from the Fen Ho

As shown on the accompanying map, there are three new diversion dams on the Fen Ho between Taiyuan and Pingyao. The first was constructed by Mr. L. H. Wang three years ago. The second will be built this spring. The third was completed in late 1933. These are masonry sluices for diverting the flow of the river into irrigation systems. They replace eight earth dams that were rebuilt annually for the same purpose in former times. They divert water from the main river into 20 irrigation ditches which are grouped so as to get water in rotation. These new structures that were designed and built under Mr. Wang's supervision, rest on wood-pile foundations and are built only slightly higher than the adjacent land. The first one has proved sufficiently useful to warrant building the other two. They cost approximately $150,000.00 each.

The old earthen dams that were formerly used were built each autumn by the communities benefited. The one farthest upstream had to be completed by the end of October and must be broken to let the next earthen dam below it have a turn after a specified number of days of irrigation. Then the second dam gave way to the third, and so on through the series. Nothing was left of any of these dams at the end of the season in early March. It meant considerable waste effort and material, consisting chiefly of piling and kaoliang stalks. From March to late October no dams were permitted but during this period 48 canals immediately up river used the natural flow for irrigation. The new masonry dams or sluices modify the former system and seem very acceptable to the farmers.



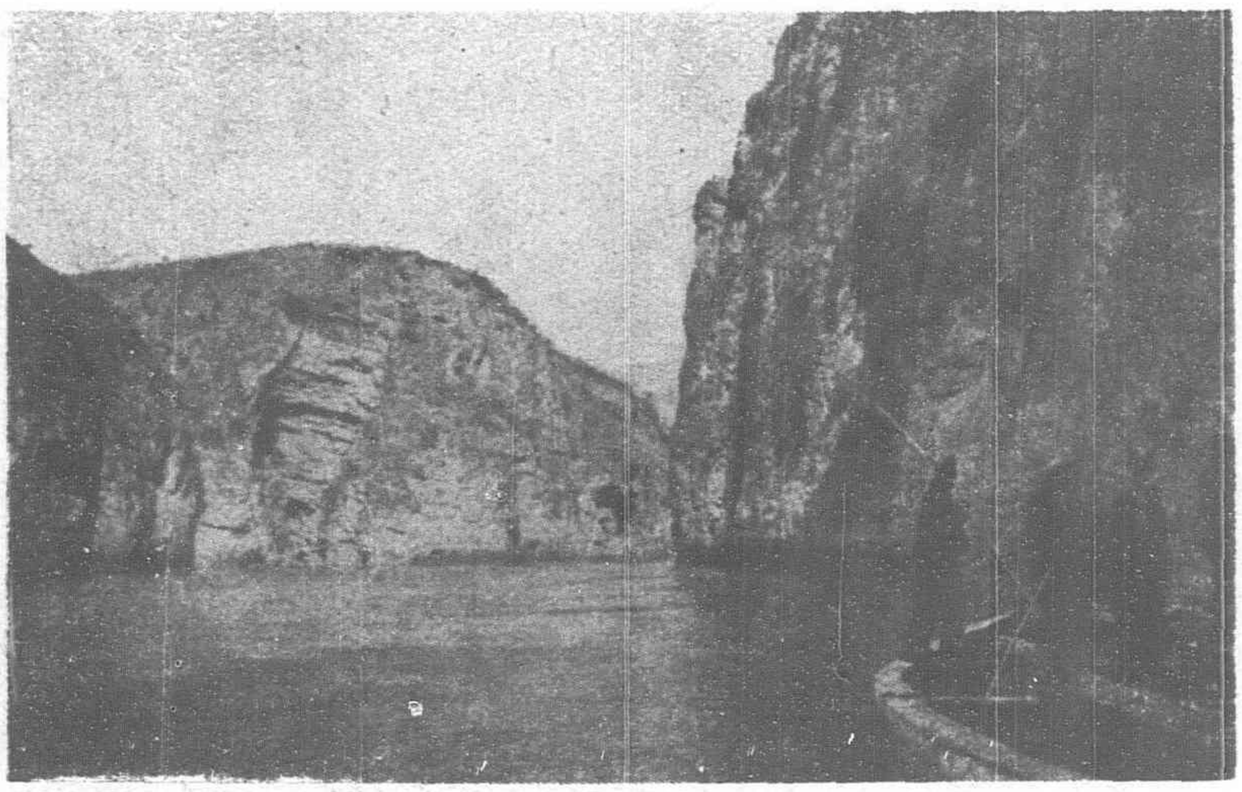
60,000 to 100,000 Horse-power being lost on ordinary flow of Yellow River at Hu-K'ou falls, west Shansi

Floods Protection for the Fen Ho

A rather thorough topographical survey made last year of the Taiyuan-Fenchow-Chiehsiu valley of the Fen Ho shows that the river has wandered almost at will over this plain for many centuries. The fine loess soil is so easily eroded that earth dikes are of little protection in times of large flood flows. Sodded dikes have been of value near Taiyuanfu but in 1932 they gave way. Stone has played very little part in holding this stream to one fixed course.

It is now planned to straighten this channel and place stone protection along the inner channel for the low-water and the mean-water flow. Outer dikes, well sodded, will keep the flood flow from getting out of bounds. Masonry escape weirs will regulate the flow that must go between the two sets of dikes during flood periods. Such periods will be of short duration as shown by the daily discharge measurements made by our staff this summer and autumn.

A beginning on this new channel was made this autumn between Pingyao and Chiehsiu when a leading channel was dug for a distance of eleven miles and the Fen Ho turned into it. The excavated earth was carried out a distance of 250 feet on both sides from the center line of the new channel. These are the dikes that should have stone protection. The earth work in this new channel totalled 250,000 fangs and cost $100,000.



Traveling up the gorges of the Yellow River North of Yumenk'ou



Pumping plant 35 li north of Chiangchow

This matter of stone work on river banks is always formidable in China. It is costly and takes years. Haulage by cart beyond a few miles is impractical. The stone must be found somewhere along the river or within a mile of its banks if possible. Boats must be found or made for the transport. In the case of the Fen Ho there are none to be had except as new ones are constructed for the purpose. Shansi never did this type of work on her rivers as has been done along the Yellow River, for example. From 100 to 400 boats should be constructed at once and put at this work eight months of the year until the job is finished five to ten years hence. In this soil that is so easily eroded there seems no other practical solution of this flood problem. Detention reservoirs can only smooth out the crest of flood waves. The silt load is too great in flood season to permit the closing of gates for detaining flood waters even for a few days. Dams are too costly and storage would be exhausted too soon.

Lower down the Fen Ho at Chiangchow and near Hotsin the Fen Ho has been leaving its banks in recent years and damaging crops. The flood problem in that region may be solved much as it will be solved below Taiyuanfu and near Pingyao, but in the southern stretches of the river the damage is less extensive and therefore the improvements less pressing.

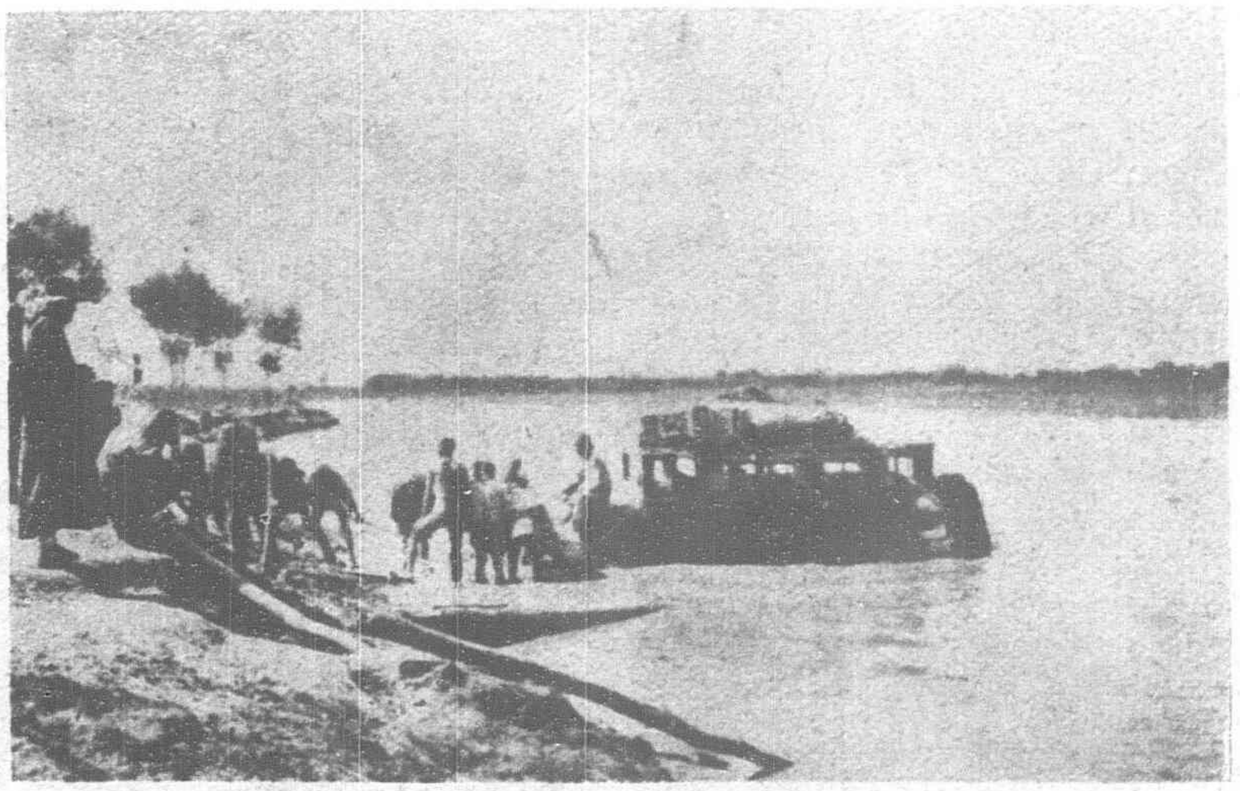
Pumping Plants for Irrigation

In order to get Fen Ho River water onto adjacent lands, where gravity irrigation was impractical, Mr. Wang laid out three new irrigation systems in 1930 to be served by pumping plants. One is a few miles below Pingyangfu. A second is twelve miles above Chiangchow. The third is five miles east of Hotsin. The areas served are 18,000 (3,000 acres), 33,000 mou (5,500 acres), and 17,000 mou (2,833 acres) respectively. These plants have been only partially successful as yet due to lack of adequate financing. This past year they have been improved and should operate well during 1934.

Hydro-electric Power from the Yellow River

A large area of land in south Shansi is too high to be irrigated from the Fen Ho and requires more water than that river can furnish after being drained by other irrigation projects. It is therefore proposed to develop the Hu-Kou falls of the Yellow River, located 60 miles upstream from Yumentu, where the gorges end. I visited these falls late last April making some preliminary measurements. This winter we will make surveys on which to base estimates in connection with their development. It seems probable that the low water flow of the Yellow River at this point will be 60,000 horse-power in electrical energy. A portion can be used to pump Yellow River water at Yumentu to adjacent lands. Surveys are being made to cover this whole problem though it is likely that a plant burning coal at less than $2.00 per ton will furnish the first power developed in this region to operate such pumps for irrigation. The development of the Yellow River falls must be dependent on a broader scheme of use that will include transmission as far as Sianfu.

Not only are surveys for this waterfalls being made, but also our Commission is laying out a motor road from a point 10 miles south of Pingyangfu west to these falls so that construction materials such as cement, heavy machinery, pipes, etc., can be taken to the river at reasonable cost. This road will be 80 miles long.



Hauling an Autobus out of the Sha Ho River at the ford

The Sang Kan Ho District

Surveys of the four irrigation districts in the Sang Kan Ho region were made starting August 1, 1933, and ending December 1, 1933, to check up on the difficulties that have hindered the irrigationists in this section. The works that exist are primitive in many respects. It appears that no adequate surveys had ever been made of the region. The present appraisal studies will be the basis of a report soon to be printed pointing out where improvements can be made for these canals.

The Hutu Ho in Central Shansi

In the province of Hopei the Hutu Ho is a river of large proportions in flood seasons. Its water is used west of Shihchiachwang for irrigation, and improvements to it are being made by the North China River Commission in that region. But near Shinchow, Shansi, the irrigation from the upper stretches of this river is unsatisfactory in that it is too limited. Studies are going forward by the Shansi Water Conservancy Commission in early 1934 to get data on which to base plans for extension of the usefulness of the upper part of this river. Preliminary surveys have already begun.

The Chang Ho in South-Eastern Shansi

As yet engineers have not made a study of the Chang Ho, but this problem is assigned to the Shansi Water Conservancy Commission for the spring of 1934. Irrigation and flood control are both to be considered. A special report on this river will be prepared in late 1934.

(Continued on page 46)

Phases of Railway Activities in Japan*

By SABURO MOTOJIMA

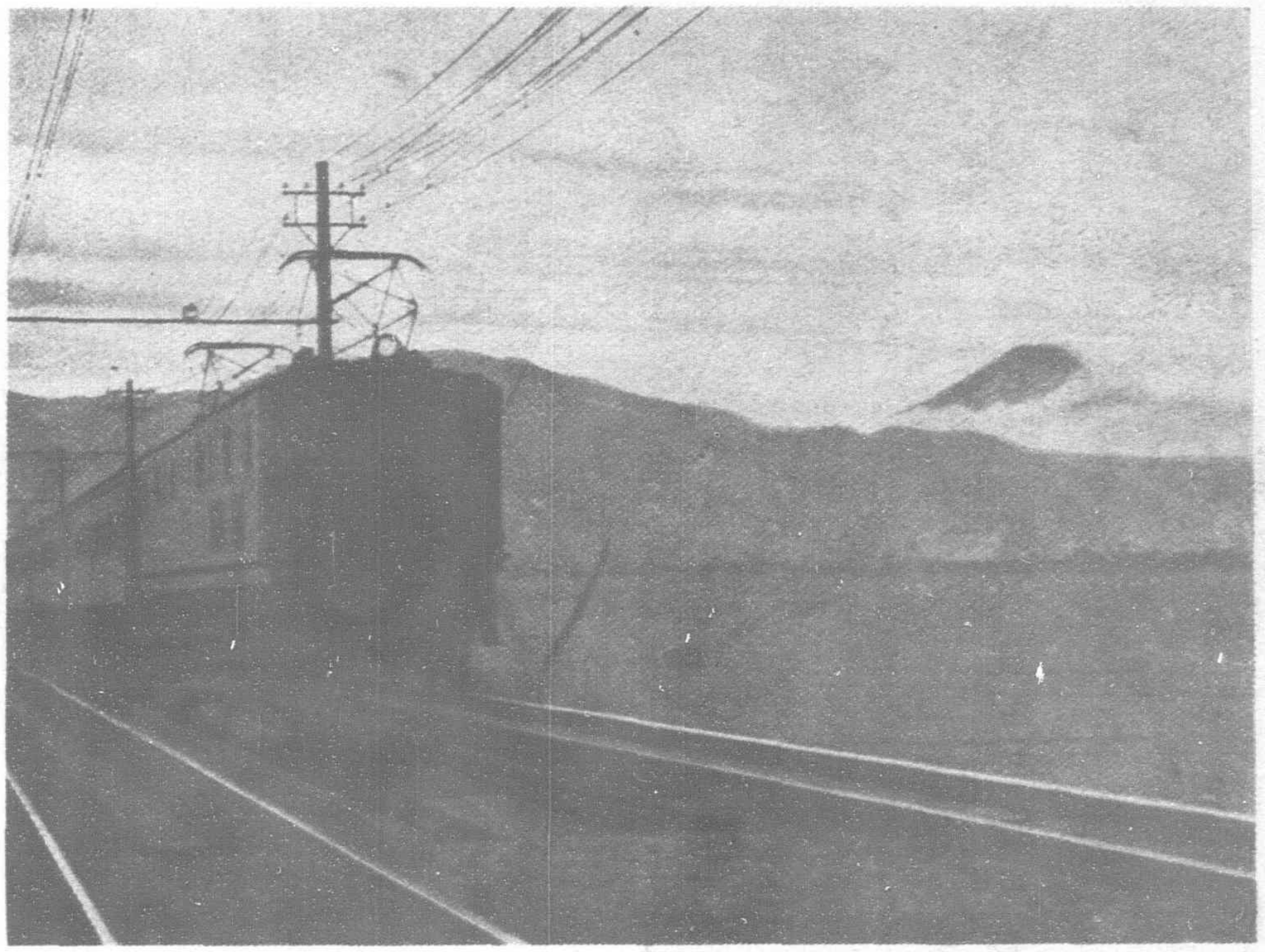


Photo by K. Miyamatsu

An electric locomotive in motion photographed near Kozu Station with Mt. Fuji glorified by the splendor of the sunset glow

It is about half past three in the afternoon. The "Fuji" Limited Express is running west at full speed along the shores of Suruga Bay on the Tokaido Line, and, beyond the blue sheet of the sea, the snow-topped Mt. Fuji is showing its ever graceful outline against the clear sky. While the eye is feasting on the beautiful scene from the window of the dining car, one may have a cup of tea and some refreshment for the satisfaction of one's physical needs, and in the evening the train will take one to the large cities of West Japan, such as Kyoto, Osaka and Kobe, which invite a visit.

It is not without interest to reflect that some 65 years ago the railway had not come into existence in this country as a public conveyance, and that it took more than a fortnight for travellers to cover the same distance.

The first railway of Japan was opened for traffic over a distance of 18 miles between Tokyo and Yokohama in the year 1872 under the administration of the Government, and the rolling stock introduced then consisted of 10 engines, 58 passenger cars, and 75 freight cars. To-day the Japanese Government Railways own 4,020 locomotives, 10,416 passenger cars, and more than 64,900 goods cars, maintaining a highly efficient system of 9,758 miles, besides private and colonial railways of approximately 11,650 miles, which are operated under private ownership and management, and the facilities of railway transportation serve almost every part of the country in conjunction with numerous branches of local motor-bus traffic.

Besides extensions continually made on their lines, the Japanese railways have highly developed efficiency in accommodation and other respects.

The report for the fiscal year 1932 contains the following figures:—the capitalized fund of the Government Railways of Japan, Y.3,563,000,000; the revenue for the year, Y.425,954,073 and expenditure, Y.265,081,895; the operating ratio, 62.2 per cent. During the year 781,149,732 passengers and 61,732,756 metric tons of freight were carried.

The space of 63 years has developed Japanese railways, which began with a line of 18 miles, to an enormous national enterprise!

Although most of the railways in Japan are of 3-ft. 6-in. gauge, about 1-ft. 3-in. narrower than the American, British and other European standard, comfort of railway travel is not in any way affected thereby.

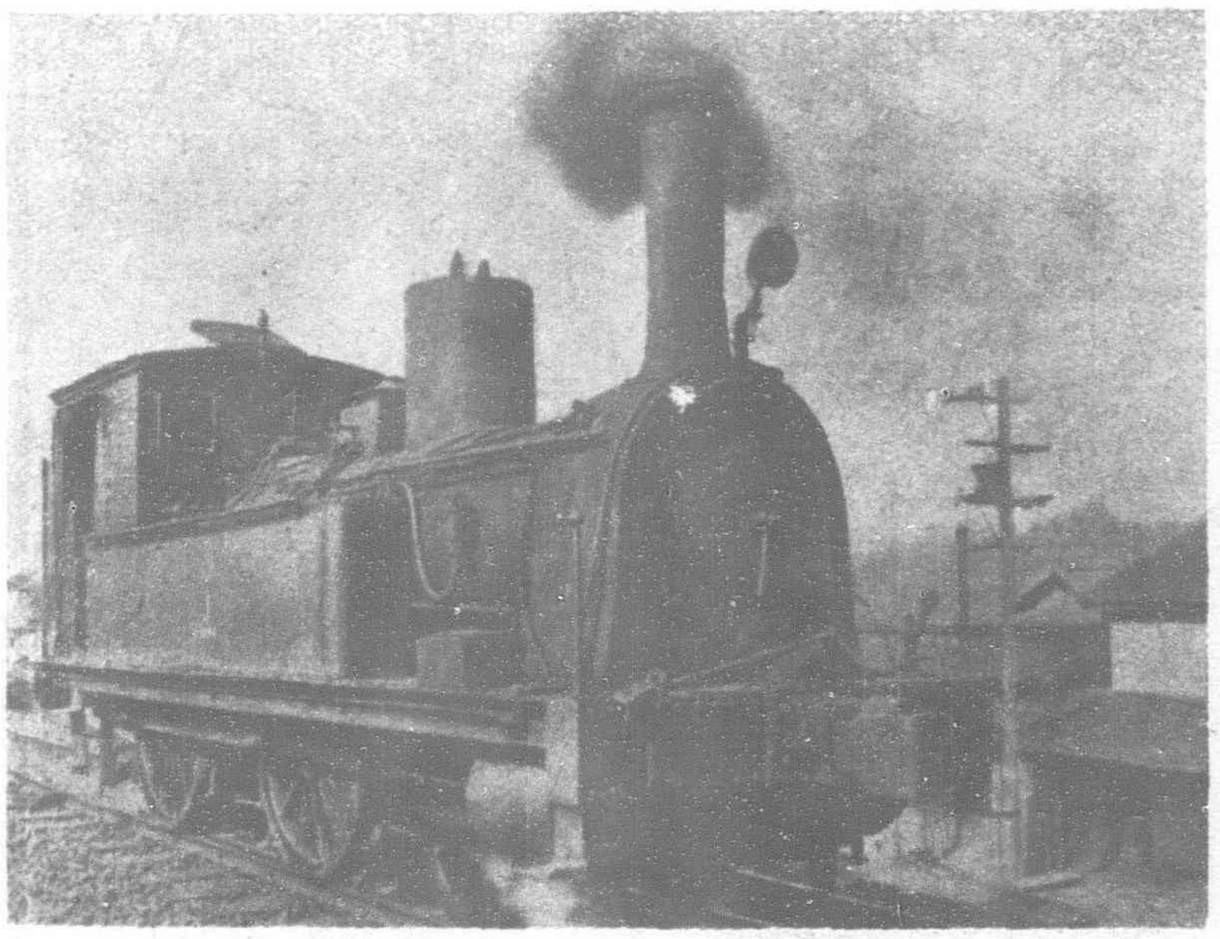
The passenger carriages in use on the Japanese Government Railways are designed to the maximum extent of scale and equipment for the narrow gauge, and there is but little difference between them and those on the wide-gauge railway. This fact will be understood from some of the Japanese railway activities to be described in the following.

Express Services on Main Lines

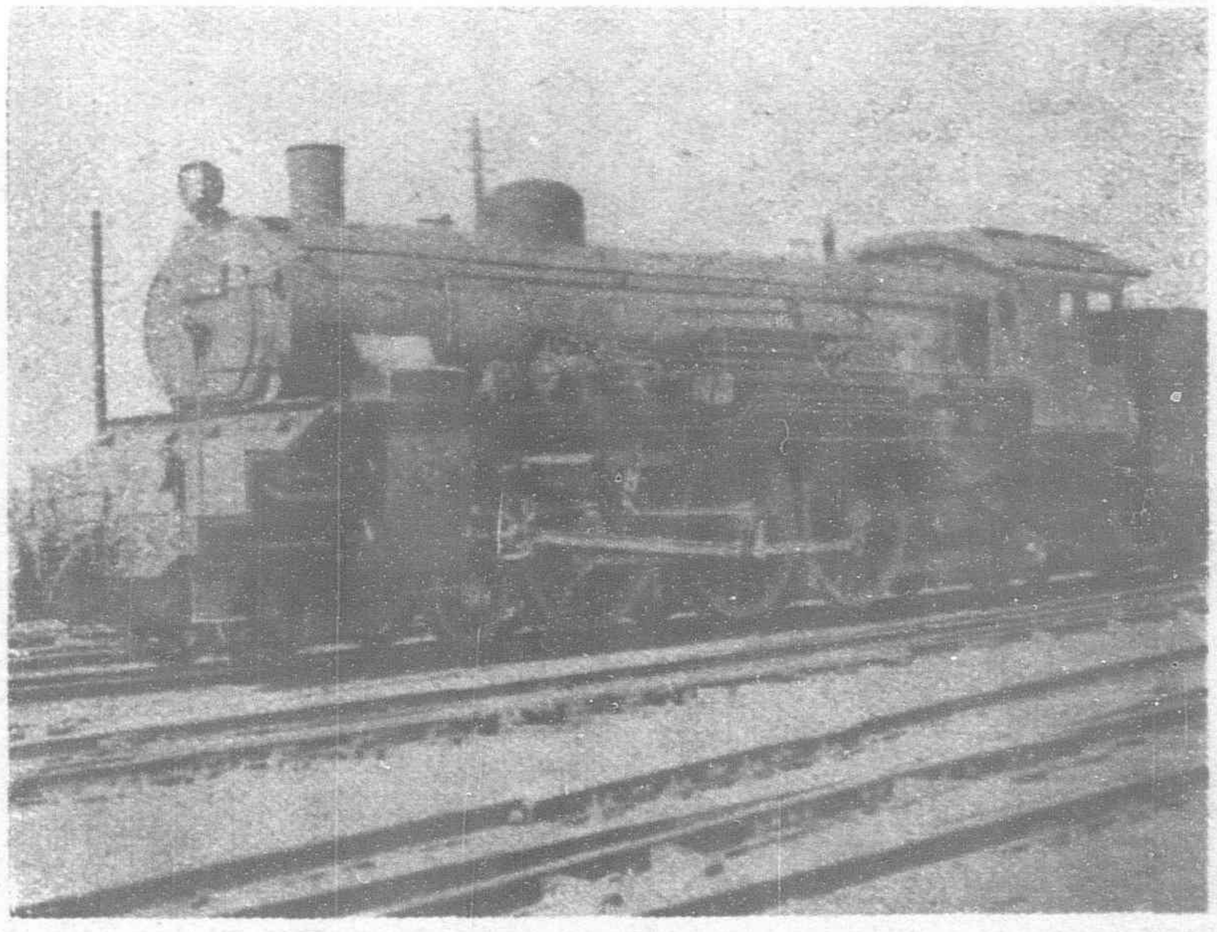
One of the most interesting facts about Japanese railways is the remarkable speed attained by express services on these narrow-gauge metals.

The most important main route of the Japanese State Railways, over which the heaviest traffic is carried, is the Tokaido-Sanyo Section, which represents a distance of 702.8 miles from Tokyo to Shimonoseki, a port at the western end of the mainland of Japan, where connections are made by ferry steamer with Kyushu and Korea.

**The Tourist.*



The first locomotive imported into Japan sixty years ago



A modern express locomotive (C 53 class, 3-cylinder 4-6-2 type)



Tokyo Central Station

Over this route passes the International Traffic between Europe and the Far East via Manchuria and Siberia Railways.

This section comprises two lines—the Tokaido Line, a distance of 373.5 miles from Tokyo to Kobe, the well-known harbor of Japan. and the Sanyo Line, a further extension of 329.3 miles from Kobe to Shimonoseki.

Exclusive of five Kyoto-Shimonoseki Services, seven through trains are run daily between Tokyo and Shimonoseki, two of which are limited expresses, three expresses, and the others ordinary through trains. Traffic is especially heavy on the Tokaido Line, as the six largest cities in Japan and many other important local towns are located along this route.

The whole section is double-tracked throughout, some portions near large cities being quadrupled. Over the Tokaido Line alone, including the trains already mentioned, three limited expresses, seven expresses, and four ordinary through trains are run daily, besides many local trains and extra seasonal services.

For the last five years, acceleration in train speed seems to have been a notable feature in the railway service of the world, for which the challenge of "air" and "road" services are chiefly responsible. The Japanese Government Railway Authorities have not been slow in framing a progressive program for the increasing efficiency of public travel facilities.

To-day the fastest train, "Tsubame" or "Swallow Limited," of which the Japanese State Railway may boast, covers the distance of 373.5 miles between Tokyo and Kobe in nine hours, with an average speed of 41.5 miles per hour, inclusive of eight intermediate stops. Its maximum speed reaches nearly 60 miles per hour. The "Swallow" is made up of eight bogie coaches of steel construction. It has four third class cars, one dining car, two second class cars, and one first class observation car, the whole weighing 320 tons. Other express services of note on the Tokaido-Sanyo Line are the "Fuji" and "Sakura" or "Cherry Flower," both of which accomplish the 702.8 miles of journey between Tokyo and Shimonoseki in 19 hours 50 minutes, including 22 stops *en route*. Although the inclusive overall average speed is 35 m.p.h., the higher average of 38 m.p.h. is maintained on the Tokaido Line between Tokyo and Kobe.

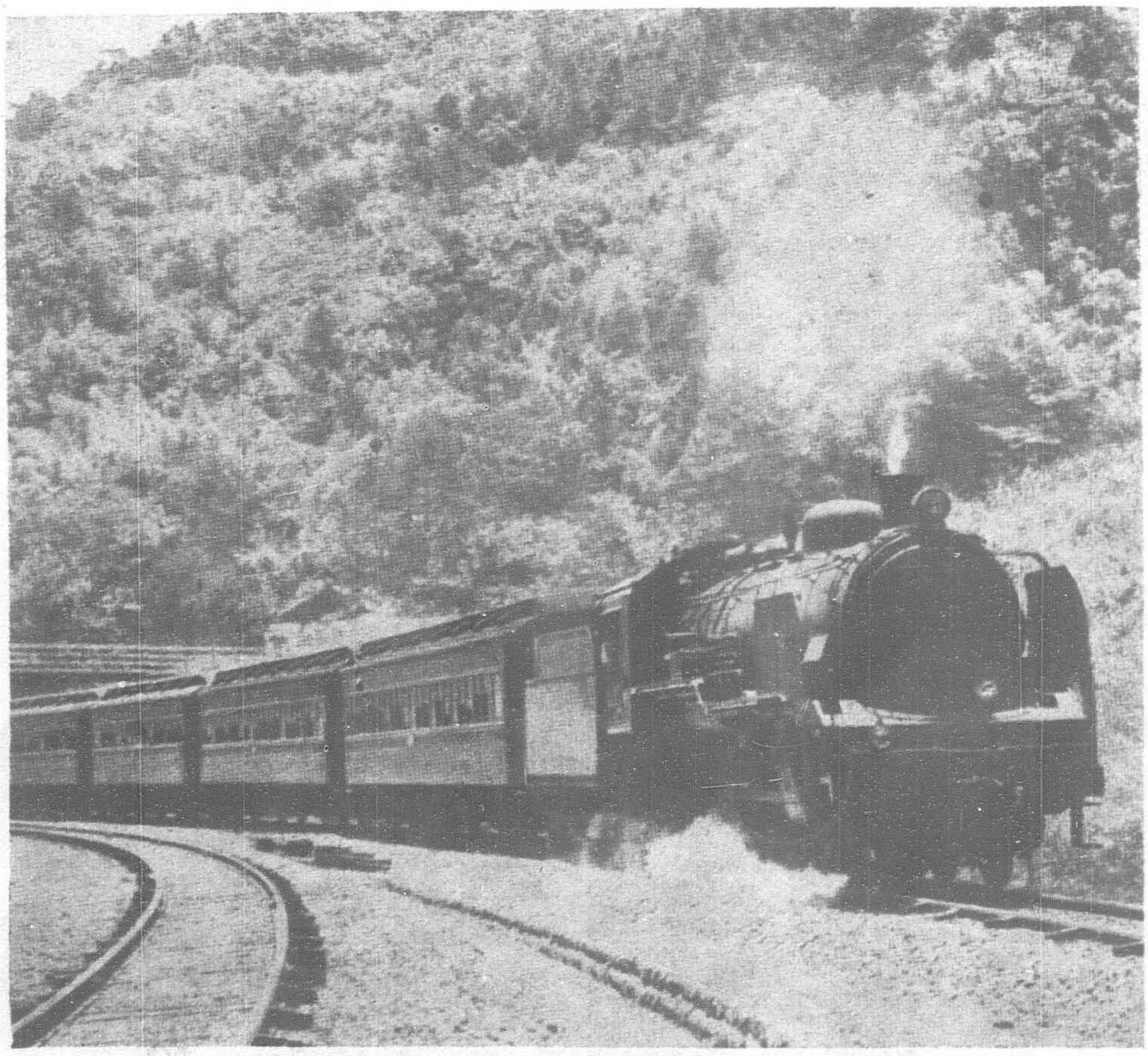


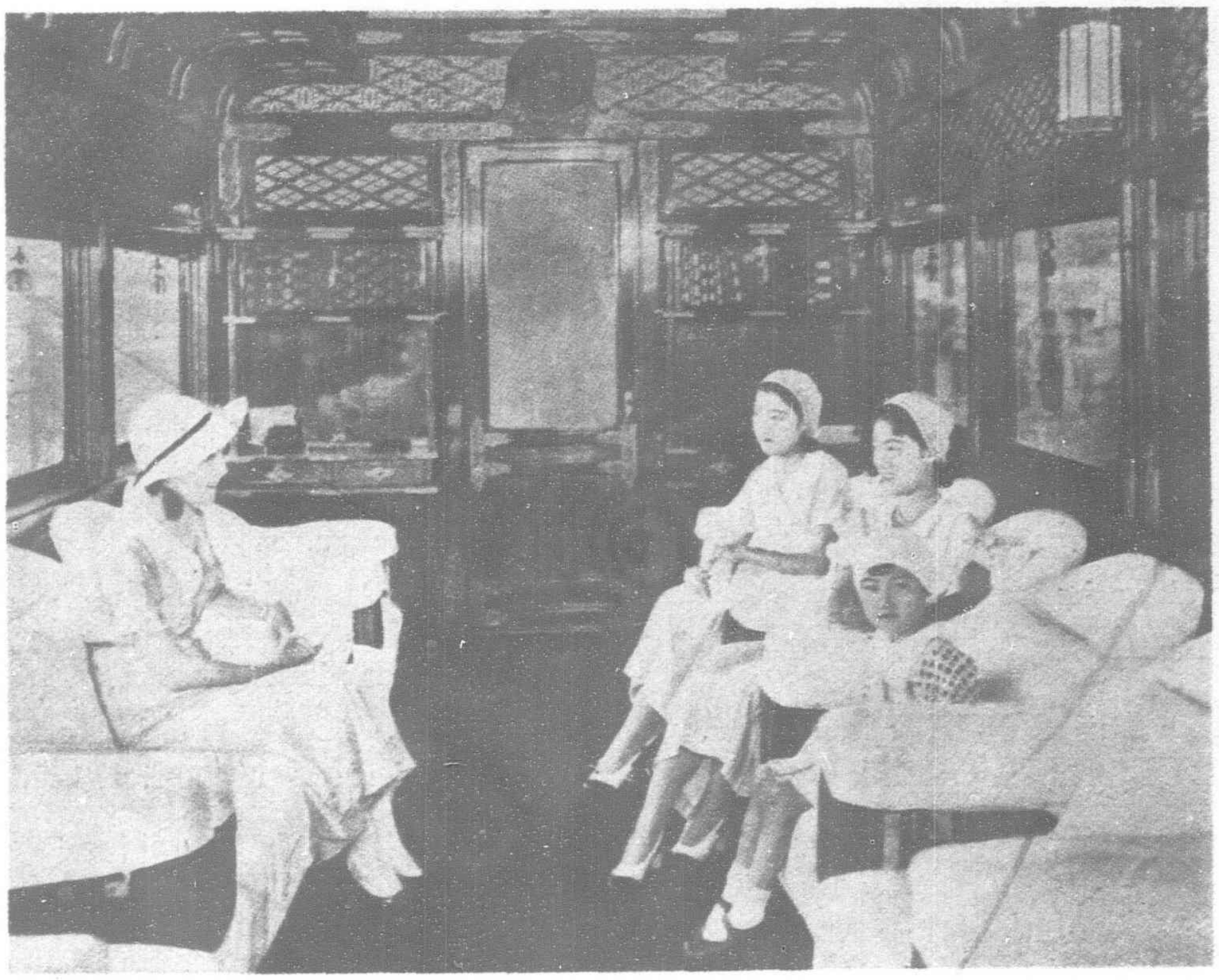
Photo by S. Motojima

An express on the Takaido Line traveling at top speed

The Fuji, named after the famous Mt. Fuji, conveys first class and second class passengers, while the "Cherry Flower" carries third class travellers only. Dining and sleeping cars are attached to both, and the former also has one first class observation car attached. The "Fuji" leaves Tokyo daily at 1 p.m. and the "Cherry Flower" 15 minutes earlier, so the two are running along the same track 15 minutes apart from starting-point to destination. Other express trains on the main lines run at an average of 28 to 32 miles per hour, stops included, and most of these have sleeping and dining cars.

These showings are regarded as highly satisfactory, comparing favorably with long distance express trains in America and other countries on wider-gauge tracks. For

example, even the "Congressional," a representative New York-Washington train of the Pennsylvania Railroad, is booked to run between the two cities at a rate of a little over 42 m.p.h., stops included. Again, there are the "Capitol Limited" of the Baltimore and Ohio Railroad and the "Daylight" of the Southern Pacific Line, neither of which maintains a speed averaging 40 miles per hour throughout, inclusive of stops. Although their car loads might be far heavier than that of the "Swallow," when the difficulty of trains work on the 3-ft. 6-in. gauge railway negotiating numerous curves and severe gradients is taken into consideration, it will be seen that the "Swallow" is giving creditable service.



Showing interior of observation car on an express train

The "Swallow"—The Fastest

Let us now take the "Swallow" at Platform No. 1 of Tokyo Central Station, whence it starts daily at 9 a.m. for Kobe.

For some 48 miles after leaving Tokyo, all passenger trains are electrically worked, viz., as far as Kozu, except in the case of the "Swallow," which is hauled by steam engines throughout. However, passengers are not troubled with smoke, as the engines on the limited express consume small cakes of smokeless briquettes. After only half a minute's stop at Kozu for an auxiliary or pushing engine, the train starts and soon finds itself among the Hakone Mountains, and while you are enjoying the fine scenery of mountain and river from the train window, the engines have to do hard work ascending a continuous stretch of 2 per cent to 2.5 per cent gradients. A 2.5 per cent gradient means that, while your train covers a distance of 100 miles, the line has a vertical rise of 2.5 miles.

Through tunnel after tunnel, twisting its way through the mountains, the train at last reaches Gotemba, the summit station, and, while passing the yard, the auxiliary engine is released from the heavy duty which it has just performed of pushing the train from almost the sea level up to the height of 2,485 feet in only 22 miles. As soon as Gotemba Station, an approach to Fuji for climbers, is passed, there follows a similarly graded descent of 15 miles until Numazu is reached. It is on this section—from Numazu to Shizuoka—that fine views of Mt. Fuji are enjoyed from the train, and, if it is a fine day late in autumn, for instance, one will be privileged to see a never-to-be-forgotten sight, the symmetrical cone of "Fuji-Yama"—the pure snow-crowned peak clear cut in the serene blue sky, just as it is depicted in Hiroshige's color prints.

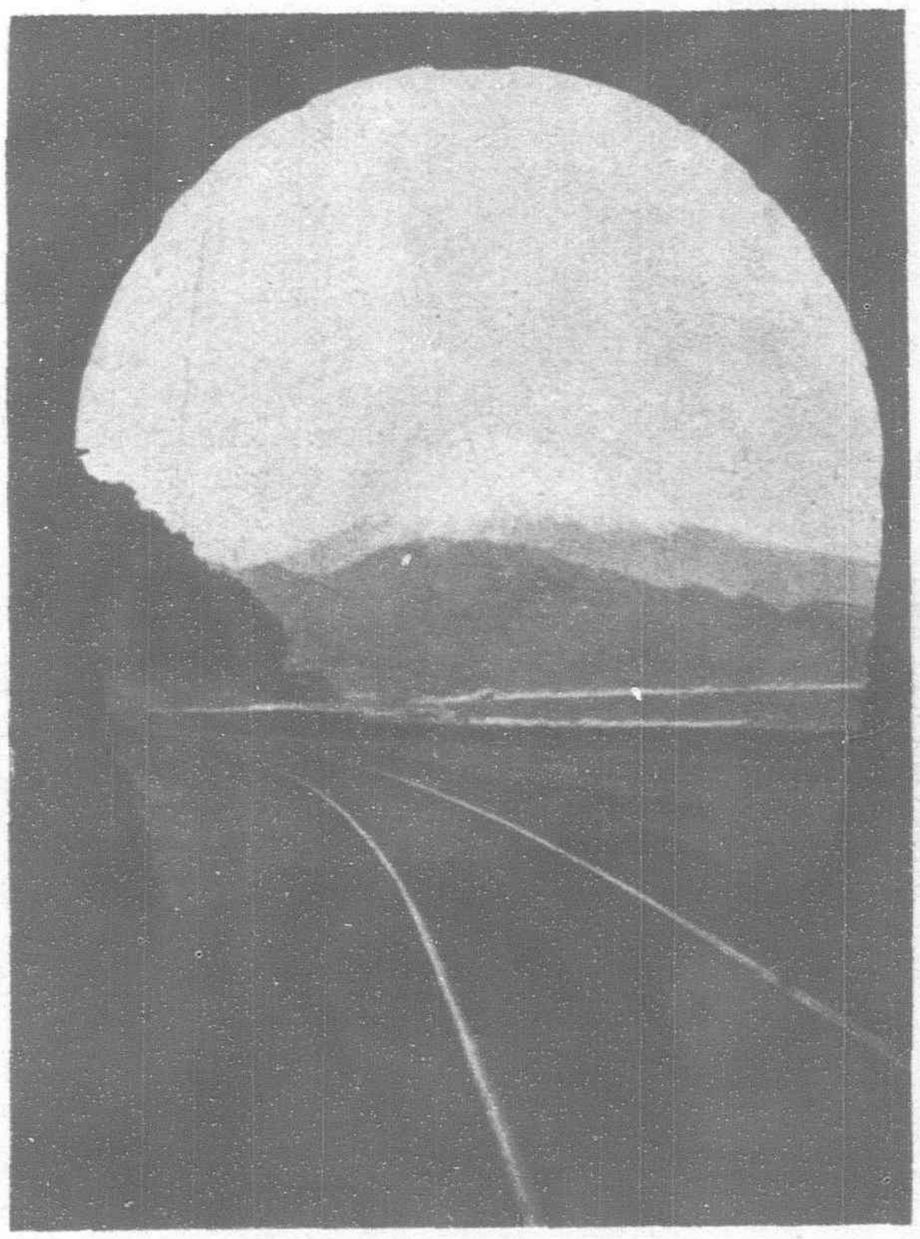
The train calls at Shizuoka for water supply preparatory to beginning a 115 mile run thence to Nagoya, and, during the journey of two hours and a half, the traveller will be able to have a glimpse of the home of the green tea industry in Japan, as well-cultivated green tea fields spread over every acre of the hillsides along the line near Shizuoka. Nagoya is one of the six largest cities in Japan and its environs have many places of interest for travellers. Engines of the "Swallow" are changed here in both directions, and this divides the locomotive working into two divisions. Besides many short stretches of comparatively heavy gradient on the route, another difficult incline, over which banking engines are required, is Sekigahara Pass, and a stop is made at Ogaki to connect an auxiliary engine. Late in the afternoon after the train is past Maibara, Lake Biwa with its fine views, comes in sight. If in the evening of spring, beyond the still waters of the lake, the purple shadow of the Omi Mountains is seen fading into the grey background.

After stops at Kyoto and Osaka, the commercial and industrial center in West Japan, the "Swallow" reaches Kobe at 6 p.m. precisely.

Some Other Fields of Activity

Another pride of the Japanese Government Railways is the punctuality of their train services, and this is a matter for admiration for foreign visitors and residents in Japan. The departures and arrivals of trains exactly correspond to the scheduled times.

The fact that express trains are operated punctually on the 3-ft. 6-in. gauge at such a high speed and in perfect safety, is due to an excellent combination of well maintained tracks, locomotive stock of progressive design, modern mechanical equipment, and trained and experienced railway servants.



Mt. Fuji seen from a tunnel on the Tokaido Line

Over the Tokaido-Sanyo Line, the tracks are laid on a solid bed with heavy 100 lbs. per yard rails, and automatic color light block signals, which control the train operation and keep it in perfect safety, are installed, as seen on the first class railroads in Europe and America.

The motive power should also be mentioned in brief, and how it is worked is regarded as a barometer of the railway business. For the last two decades the Japanese Railways have, with few exceptions, had their locomotives built in Japan. The Government Railways introduced twelve years ago a series of 4-6-2 type engines for main line express duty. However, to cope with the increasing weight of the train unit, a more powerful locomotive, to which heavy express trains could be entrusted, became necessary, and finally came the C53 class 3-cylinder 4-6-2 type locomotive. The notation of 4-6-2 type

means the wheel arrangement of two small pairs of leading wheels in front, three large driving pairs in the center, and a small trailing pair in the rear, plus the tender.

Equipped with modern mechanical apparatuses, the engine is of thoroughly progressive construction, and has driving wheels of 5-ft. 9-in. diameter comparatively large for the narrow gauge.

The series consists now of 97 engines, and all are allocated to the Tokaido-Sanyo Line for the haulage of heavy express and through trains.

Electrification has been in progress over the suburban area as well as on the main line, and electric locomotives and electric motor coaches of excellent design have been assigned to these duties. The Tokyo-Yokosuka electric train, which consists of six to eight motor-cars and trailers, may be taken as typical, and the departure almost every thirty minutes of this train, which is booked to run between Tokyo and Yokohama at an average of 37 m.p.h., is much appreciated by the public, especially suburban residents who reside along the route.

As regards the passenger carriages, the railway authorities especially lay stress upon the comfort of the passenger, and, as was mentioned previously, the 3-ft. 6-in. gauge passes unnoticed by experienced travellers from over seas, who praise the comfortable accommodation of express trains on the Japanese Railways.

As Japan proper consists mainly of four large islands, the breaks of train transport are served by a fleet of Government Railway steamers, which convey freight wagons on the deck as well as passengers. Over the 100 miles between Aomori, a northern port of the mainland, and Hakodate, key port to Hokkaido, four excellent 3,400 ton ferry steamers daily make three trips both ways. Fusan, a gate port of Korea, is also connected with Shimonoseki by the Government Railways' steamer service, and four 3,600 ton steamers ply between the two ports.

The Japanese Government Railways have endeavored to serve as a public utility to the best of its ability.

One of the recent remarkable engineering feats is the Tanna Tunnel,* 4.85 miles long, which was projected to eliminate heavy gradients and curvatures on the present Hakone route. It was recently completed after 15 years' hard work. The enormous sum Y.24,300,000 was spent and 63 men met their death in bringing the difficult work to a successful conclusion. On the completion of the new route, over which trains are electrically operated as far as Numazu, it will mean a cut of seven miles off the present course, the maximum gradient being reduced from 2.5 per cent to 1 per cent. The traffic over the new route is expected to be opened by November of next year.

Thus the Japanese railways are constantly developing in every department of transportation service for the benefit of the travelling public.

*See *Far Eastern Review*, May, 1933.

Simons Dredgers for the Far East

(*Continued from page 38*)

driven and the equipment will include a standby Diesel-electric generating set. The hull is specially designed and strengthened throughout to cope with heavy pumping duty.

Owing to the large amount of sediment and vegetable matter brought down by the river, a special closed-circuit Cooling System will be installed. The engines will be cooled by clean fresh water, provision for a large bulk supply of which is made in the hull, and this cooling water will in turn be cooled by circulation of filtered river water.

Complete arrangements for overhauling all the machinery are being provided.

We believe this is the first large Diesel driven dredger to be built on the Clyde, and indeed in this Country, and Messrs. Simons are to be congratulated on their good fortune and enterprise in securing the order for this important development.

The firm have also received an order from the Chinese Purchasing Commission for a small Steam Driven Cutter Suction Dredger of their Patent Radial design, the special feature of which is that the hull is held stationary on three spuds while the disintegrating and suction mechanism is traversed to and fro across the desired width of cut. The forward spuds are equipped with rams by means of which the dredger is travelled forward to take successive cuts.

This type of dredger is particularly suited for work in narrow channels, as it is entirely independent of outside moorings.

We understand this contract is under the direction of Sir J. H. Biles & Co.

How the Yellow River Bridge on the Kinhan Railway was Saved

(*Continued from page 22*)

now being made to ascertain whether it is necessary to make any radical change in safeguarding this pier. The original method was simply to use a concrete block to hold the pier down.

From the very beginning the piers were surrounded with a thick layer of large stones to prevent scouring. 100,000 cubic meters of rubble were used at completion of the bridge and then from 1908 to 1931, rubble was added from time to time as the scouring developed totaling 181,259 cubic meters. This year's flood has carried off a good part of the stones and in most cases none remain to a depth of four to five meters in the river bed. Previous to this flood it was estimated that there must be stones to a depth of about 10 meters around the piers, resulting from the annual addition of rubble, but now it is estimated there must be only about two or three meters of stone left at the bottom.

A Study of Shansi's Rivers

(*Continued from page 42*)

It will be noted by reading this brief outline that the purpose of the present river studies in Shansi is primarily to aid in irrigation so that the food supply will be more thoroughly insured. Shansi often suffers from drought. Her available waters must be conserved whenever possible at reasonable cost. The problem of flood control is of less moment, though it needs attention. The development of hydro-electric energy on the west border by harnessing the Yellow River falls at Hu-Kow is something to be studied well in advance though actual construction may not be pressing at the moment since there is much cheap coal for power at points near-by. It has been asked how Shansi or its neighbor, Shensi, or the two provinces, could use 60,000 to 100,000 horse-power should it be decided to develop the falls to operate a plant of that capacity. No great manufacturing towns are at hand, and none are likely to be developed in that region for many years. One scientist has replied that the surplus power might be used to make fertilizer from the air as is planned for Muscle Shoals. This might be used to advantage to replenish the farm land of both Shansi and Shensi.

But in all of these studies the problem of navigation does not enter. It has been raised as to the Yellow River but the Shansi Water Conservancy Commission has not undertaken those studies. The interior rivers of this province will not lend themselves to commercial transport of any consequence.

Urgansk Locomotive Works Opened

The Lugansk locomotive plant in the Ukraine commenced operations on January 1. When running at full capacity, it will have an output of 1,080 locomotives per year, as compared with a combined output of all the existing plants in the country of 811 engines in 1931 and 844 in 1932. It is the largest locomotive works in Europe. The engines to be produced by this pant will be of a powerful type, with a capacity of 20 tons per axle. This compares with an average of a little more than 11 tons per axle of the locomotives now in use in the U.S.S.R. The plant was under construction over a period of four years and involved investments of 100 million roubles. However, a large part of the work was done in 1932, during which the investments amounted to 70 million roubles. In the first year of its operation the plant is expected to produce 250 locomotives.

Japanese Railway Building Program

FORTY-SIX lines of the Japanese Government railways, extending 717.7 kilometers, will be opened for traffic during the 1934-35 fiscal year. This is acclaimed to be the greatest achievement the Railway Office has ever chalked up in a single year.

Also, this achievement is stamped as a case in which Railway Minister Mitsuchi's policy of "each and every line strictly on merit" has been exemplified. Mr. Mitsuchi, since he assumed office, has striven hard to turn a new leaf in railway construction, leaving out or postponing lines of doubtful economic value.

Of the 46 lines to be opened for traffic, 14 will mark the completion of the entire lines, including the Kurume-Oita line, the Ariake line and the Hida-Etchu line. Also included among them are the short cuts of the Atami-Numazu line, traversing the recently bored Tanna tunnel, and the Iwakuni-Tokuyama line, which are expected to speed up traffic over the Tokaido and San-yo lines considerably.

Below are the principal lines to be opened for traffic during the next fiscal year :

Kanto District

(1) The Mito-Koriyama line, extending from Ibaraki to Fukushima prefectures. Construction of this line began in 1921. The opening of the last link of 31.7 kilometers between Kawahigashi and Tanakura (Fukushima Pref.) next summer will mark the completion of the entire line and an epoch in the inter-district transportation between the Kanto and Tohoku districts.

(2) The Hachioji-Takasaki line. Completion of the 11.1 kilometer stretch between Ogawa and Yorii next summer will facilitate the circular transportation around Greater Tokyo, and as the result the Shinano-Echigo district will be brought closer to the Tokaido district, doing away with the Chuo line detour.

(3) The Higashi Kihara line, Chiba prefecture. The completion of the 4.6 kilometer stretch between Sogen and Nakano next summer will open the whole line to traffic.

Tohoku District

(1) The Aizu-Tashima line. The entire line will be ready when the 19.1 kilometer section between Yunokami and Tashima is completed next fall.

(2) The Yumada line in Iwate prefecture. The 28.6 kilometer stretch between Kawai and Miyako will be opened for traffic next summer, while the 15.4 kilometer stretch between Miyako and Toyobane will be ready in the spring of 1935.

(3) The Ofunawatari line, Iwate prefecture. The 5.8 kilometer stretch between Kotomo and Kofunawatari will be ready next fall.

(4) The Gono line, Aomori prefecture. The 17 kilometer stretch between Tanosawa and Fukaura will be ready next winter.

(5) The Ainiai line, Akita prefecture. A 15.4 kilometer stretch between Takanosu and Yonenaizawa will be ready next fall.

Tokaido District

(1) The Izu line, Shizuoka prefecture. A 7.5 k.m. stretch between Atami and Ajiro will be ready by the spring of 1935.

(2) The Futamata line, Shizuoka prefecture. The 12.9 k.m. stretch between Kakekawa and Mori will be ready next winter.

(3) The Echizen-Mino south line, Gifu prefecture. The 6.1 k.m. stretch between Shiratori and Kita will be ready next summer.

(4) The Akechi line, Gifu prefecture. The 15.2 k.m. stretch between Agi and Akechi will be ready next fall.

(5) The Etchu-Hida line. The 27.7 k.m. section between Kosaka and Takayama, and the 302. k.m. section between Takayama and Sakagami will be ready for traffic next fall. This will mark the completion of the short cut between Toyama and Gifu.

Hokuriku-Nagano District

(1) The Wajima line, Ishikawa prefecture. The 11.0 k.m. section between Anamizu and Mitsui will be ready next fall.

(2) The Omachi-Itoigawa line, Niigata and Nagano prefectures. A 10 k.m. stretch between Itoigawa and Neji will be ready next summer.

(3) The Shokai line, Nagano prefecture. A 7.8 k.m. stretch between Sakuminokuchi and Goshodaira will be ready next winter.

Kinki District

The Kii-Ise east line, Mie prefecture. The 17.3 k.m. section between Minose and Owashi will be ready next fall.

San-in District

(1) The Iyoshi-Gotsu line, Shimane prefecture. The 10.4 k.m. stretch between Kawagoe and Kawamoto will be ready next fall.

(2) The Kisuki line, Shimane prefecture. A 14.7 k.m. stretch between Minari and Yakawa will be ready next fall.

San-Yo District

(1) The Iwakuni-Tokuyama line, Yamaguchi prefecture. With the opening of the 25 k.m. stretch between Iwakuni and Takamizu in the spring of 1935 the entire line will be completed. This will mean the shortening of the San-yo main line by 21 k.m. and will speed up the running time by 15 to 20 minutes.

(2) The Miyoshi-Niimi line, Hiroshima and Okayama prefectures. The 6.4 k.m. stretch between Tojo and Yawata will be opened next summer, and the 8.6 k.m. stretch between Saijo and Ochiai will be opened next winter.

(3) The Fukuyama north line, Hiroshima prefecture. A 5 k.m. stretch between Kisa and Yasuda will be opened in the spring of 1935.

(4) The Himeji-Tsuyama line, Okayama prefecture. The 20.7 k.m. stretch between Higashi Tsuyama and Emi will be opened next summer.

(5) The Mihara-Kure line, Hiroshima prefecture. The 12.6 k.m. stretch between Takehara and Hayatawara will be opened next summer. The 6.3 k.m. stretch between Hayatawara and Utsumi and the 6.8 k.m. stretch between Hiro and Kure will be opened next winter.

Shikoku District

(1) The Takamatsu-Tokushima line, Kagawa and Tokushima prefectures. The 3.7 kilometer stretch between Hikida and Sako, which will be opened in the spring of 1935, will mark the completion of the entire line, construction of which began in 1923.

(2) The Tosa-Sanuki north line, Tokushima prefecture. The 12.7 k.m. stretch between Minawa and Nishiu will be opened next fall.

(3) The Tosa-Sanuki south line, Kochi prefecture. An 11.3 k.m. stretch between Osugi and Shimodoi will be opened next fall.

(4) The Yawatabama line, Ehime prefecture. The 16 k.m. stretch between Kaminada and Nagahama will be ready next fall. The 15.6 k.m. stretch between Nagahama and Osu will be opened in the spring of 1935.

Kyushu District

The Ariake Bay line, extending from Yamaguchi, Saga prefecture, to Isahaya, Nagasaki prefecture, begun in 1926 as a short cut to the Nagasaki line, will be completed in the spring of 1935, at which time the train journey to Nagasaki will be cut by 30 minutes.

The last 19.8 k.m. stretch of this line between Tara and Yue will be opened for traffic early in 1935. The country traversed by this route abounds in places of scenic beauty.

The Kurume-Oita line, Fukuoka and Oita prefectures. The last link of 11.9 k.m. between Hida and Amagase on the provincial border of Bungo and Chikugo will be opened in the spring of 1934.

Engineering Notes

INDUSTRIAL

GASWORKS FOR CANTON.—A German engineer has been retained to design a gasworks at Sai Chuen, Canton, at a cost of about $1,000,000.

NEW WOOLLEN FACTORY.—The Manmo Woollen Textile Co. propose to increase its capitalization to Y.1,000,000 from Y.500,000, in connection with the erection of a new factory in Mukden.

MALACCA WATER SCHEME.—At a committee meeting of the S.S. (Malacca) Association Mr. V. C. Currier suggested that a letter be written to the Malacca Municipality for a filter water supply scheme similar to the one in use at Port Dickson.

KUALA LUMPUR SEWAGE.—There was a unanimous vote at the meeting of the Kuala Lumpur Sanitary Board for a resolution that the Board should borrow money for capital works from Government, particularly for a waterborne sewerage scheme.

KWANGTUNG CONSERVANCY.—As a precaution against flood the Kwangtung River Conservancy Board intends to construct several water gates on the West River. The Board applied to the British Boxer Indemnity Fund for a loan of $600,000 to carry out its flood prevention work and the application has been granted.

BUND AT HONAM.—It is expected that the construction of the new bund in the Honam Island, opposite Canton, will require three years to be completed, the cost being, estimated at $2,475,000.

The bund will stretch from the foot of the Pearl River bridge to Chowtouchiu, where the inner harbor is located.

DISPOSAL OF TOKYO REFUSE.—Part of Tokyo's daily garbage collection of 2,192,000 lbs. is to be converted into fertilizer by Tokyo Municipality through an Italian process. The plan is to benefit farmers and add to the city's revenue. The incinerator at Fukagawa is to be equipped with a large number of concrete silos in which garbage suitable to the process will be fermented. Dried, it will contain six per cent of nitrogen. The process, when the full plant is in operation, will produce 12 tons of fertilizer a day.

STEEL WORKS FOR CANTON.—In accordance with the five-year plan for the reconstruction of Kuangtung, the Canton authorities are proceeding with a scheme for the establishment of an iron and steel works at a cost of $20,000,000. The site of the plant has been selected, over 2,000 acres having been acquired at Shihchin, on the outskirts of Canton, where the arsenal is situated. The five-year plan provides for the erection of an up-to-date coke oven, blast furnace, steel-making plant and rolling mills. As a start, the Provincial Bureau of Reconstruction has decided first to erect a blast furnace capable ot turning out 250 tons of iron a day.

COTTON MILLS IN CANTON.—A peculiar feature of Canton's industrial situation is that there is not a single modern cotton mill in the city, despite the increasingly large demand for cotton yarn. Official statistics reveal that Canton is at present importing from England and India £2,500,000 worth of cotton yarn annually. In view of this situation the authorities are making plans for the establishment of a cotton mill on as large a scale as those operating in central and east China. It is understood that the bulk of the new plant, from the bale-breaking machinery to the looms, will be supplied by Messrs. Platt Brothers & Co., the British textile machinists.

SINGAPORE RUBBER PLANT.—A plant for shipment of latex in bulk is being erected for Dunlop Plantations (Malacca), Ltd., on the premises of the Singapore Harbor Board. As in the case of the palm oil bulk shipment system recently completed at Tanjong Pagar, the Harbor Board is to erect the plant which will have a capacity of 150 tons, with ample room for extention. The tanks will be underground and the latex will flow from the rail wagons into the tanks by gravity. When sufficient latex for any particular shipment has been collected the latex will be blown by a compressed air plant to an overhead pipe line, about 660 feet in length and 20 feet above the ground. At each end of the pipe line, flexible hoses will be fastened which will connectwith ships' tanks. It is expected that the first shipment will be made towards the end of the year.

SHIPPING

BRITISH SHIPS FOR CHINA.—Six steamers are to be built in British shipyards for the China Merchants Navigation Co., according to a statement issued by the Ministry of Communications. Four will be seagoing steamers, and two river craft. The Ministry has detailed an official to assist the company in its specifications for the new vessels.

IMPROVEMENT AT HAICHOW.—Harbor construction at Haichow commenced on July 1, the work being undertaken by the Netherlands Harbor Works Company. The project involves an outlay of $3,000,000, and will take 18 months to complete. It will enable steamers of 3,000 tons to enter, and includes the construction of wharves, a breakwater and dredging. Haichow Harbor will furnish a direct outlet to the sea for goods transported on the Lung-Hai line.

WORK FOR BRITISH SHIPYARDS.—The provisional contracts, for a loan of between £360,000 to £400,000 from the Sino-British Boxer Funds to the China Merchants' Steam Navigation Co. for the purchase of new boats, was signed at Nanking on August 7. The securities on the loan include a lien over the new boats and their entire receipts, and a guarantee by the Ministry of Finance to make good the payment of principal and interest in case of deficiency. The Ministry of Communications, it is stated, will send an expert to England to supervise the construction of the six steamers which the Chinese shipping company is purchasing from Britain.

CANAL THROUGH JAPAN.—A gigantic project involving the construction of a canal through the central portion of Japan to connect the Pacific with the Japan Sea has been proposed by the traffic committee of the Nagoya Chamber of Commerce. The proposal has been prompted by the necessity of accelerating traffic with Manchuria in view of the early opening of a new trade route between Manchuria and the Japan Sea coast. It is proposed that the canal should be dug in the narrowest section of the mainland and that Lake Biwa would be utilized. Upon completion, Nagoya and Tsuruga will be connected. *United Press* says that the length of the proposed canal will be 62 miles.

PORT OF RASHIN.—Preparations are being pushed ahead for converting the port of Rashin, in Northern Korea, into one of the most modern anchorages in that part of the world, one certain result of which will be the nullification of Vladivostock. With the completion of the Tunhua-Tumen railway, which connects Northern Korea with the Kirin and Heilungkiang provinces of "Manchoukuo," the construction of a modern port at Rashin is calculated to result in rapid industrial development of Northern Korea. The construction of the port will be of immense value to Japan proper, and it may be taken that the port will certainly not be an open one.

DAIREN DOCKYARD.—The Dairen Kisen Kaisha is reported to be contemplating the construction of a dockyard capable of handling steamers up to 10,000 tons. The estimate is said to be between Y.300,000 and Y.400,000. The plan is understood to be prompted by an order recently issued that the steamship company must restore to the Japanese Navy the naval dockyard at Port Arthur on the expiration of the lease in March of next year.

BRIDGE FOR THE SUNGARI.—Japanese engineers have arrived in Harbin, representatives of several large construction firms in Japan, to discuss terms with the local authorities for the construction of a large pontoon bridge across the Sungari river, to be used for vehicles and pedestrians. Harbin is greatly in want of such a structure. At present there is only a railway bridge across the river. There was some talk of aerial transport service across the river, but this project was abandoned.

RAILWAYS

EXTENSION IN JAPAN.—The Etchu-Hida-Mino line of the Japanese Government Railway, penetrating the western slope of the Japan Alps was 8.5 miles nearer completion November 12. On that day the Railway authorities opened the section between Sakagami and Sugihara, close to the Etchu border, for traffic.

NANKING PLANS RAILWAY.—In accordance with its five-year plan for the development of rural districts north of the Yangtze, the Kiangsu Provincial Government is contemplating the construction of a railway between Tungchow and Haichow. The proposed line will be 157 miles long and will be built at a cost of approximately $72,000,000.

PLAN KIANGSI RAILWAY.—Application is to be made to the Trustees of the British Boxer Indemnity Refund for a loan of $20,000,000 for the purchase of materials from Britain for the construction of the projected Yushan-Pinghsiang Railway across Kiangsi province. The total cost of construction is estimated at $40 million. The surveys are to be completed in three months. Meanwhile, the Ministry of Finance has received an application from the Kiangsi Provincial Government for appropriations of $200,000 and $700,000 toward bridge construction and purchase of materials for the line.

CONSTRUCTION AWARDS.—Railway lines believed to form the economic artery of Manchuria now being repaired by the South Manchurian Railway Co. include the Ssupingkai-Taonan, Taonan-Angangchi, Tsitsihar-Koshan and the Hulan-Hailun railways. It is understood that bids have been awarded for the reconstruction of a bridge spanning the Hulan River on the Hulan-Hailun line and for the third bridge over the Nen River on the Taonan-Angangchi line. The Nen bridge is estimated to cost Y.1,300,000 and to be completed by September, 1934, and the Hulan bridge to cost Y.600,000, to be completed by the end of this year.

CANTON-SWATOW RAILWAY.—All plans and specifications for the reorganization of the Canton-Swatow Railway have been certified by the Canton Provincial Government, and the prospects of an early start on the work are good.

According to the latest information, the Canton-Swatow Railway Administration has decided to hold a meeting in Canton to select an Executive Committee to raise the necessary capital for the railway.

It is also reported that survey of the proposed route has already been started, but owing to the great distance between Canton and Swatow, this work must take three months time to complete.